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INFO

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W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

WELL, 1984 IS HERE

It hasn't turned out much like Orwell's book, thankfully. Actually, these should be great days for hams. After all, here we are right in the early stages of the electronic revolution—something amateur radio helped in a great measure to get started. The revolution has taken some twists, so only those hams with a flexible attitude have managed to keep up with what is going on.

Indeed, I find that I have to spend a good deal of my time just trying to keep up with the onrush of technology. This means talking with people, reading several hundred technical magazines a month as well as a few books, and getting to shows—a lot of shows. They are worthwhile for me because I can see the gear, ask questions, and learn more in a short time.

Okay, you may want to know what the bottom line is of all this activity on my part. I'll tell you. . .take it easy. First, as far as amateur radio goes, you may suspect that all is not well. This is heyday time for the gloom and doomers, with ARRL membership dropping like a brick, more and more dealers going bankrupt, more of our American manufacturers becoming invisible, and the sunspots diminishing.

I prefer to look on the bright side. Here we have a new OSCAR up there begging for use. We have several new modes of communication begging for activity such as packet radio, crossband repeaters, on-the-air bulletin boards—stuff like that. With low-cost computers and chips, experimenters have never had it so good. We can build circuits in an evening that would have filled several relay racks a few years ago—so let's have at it. You build 'em and I'll publish 'em—okay?

You might like to know that we're seeing some progress with some of my other ideas. I'd like to prove what can be done in high-powered education—turning out high-tech kids with a strong business education. If you think about it, you'll realize that this would be a way to give them a super start in a career. And there is some progress with my idea for getting ham clubs started in every high school in the country. Despite the obvious need for technical people, I've run into more resistance with this idea than I expected.

Now, in case you're interested in an overview of tech-

Continued on page 116

QSL OF THE MONTH

This month's flashy winner, submitted by Jim Houston ZS6BUR, surely brightens up ham-shack walls around the world.

To enter your QSL card in *73*'s QSL of the Month contest, put it in an envelope with your choice of a book from *73*'s Radio Bookshop and mail it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not in envelopes or without a book choice will not be eligible.

Breakthrough in Boston: The Birth of Crosslinking

W1UKZ built this box. It's small and it works. The question is whether you're ready for it.

David P. Allen W1UKZ
19 Damon Road
Scituate MA 02066

A sage once said that a new idea is simply a rearrangement of old facts. This is certainly the case with crosslinking: All of the ingredients are well known and no new technology is involved. But the effect of putting them all together in a new operating mode has proven to be extraordinarily exciting to all who have participated. Let me explain just what crosslinking is.

Fig. 1 shows diagrammatically how crosslinking works. The basic idea is for an individual amateur to configure his low-band and two-meter rigs so that three operating conditions can be maintained:

1) When the amateur keys his microphone, he transmits simultaneously on *both* a low-band frequency and a two-meter frequency. One microphone keys both rigs.

2) When the amateur *listens*, he pushes a button which feeds the audio output of whichever band he is momentarily listening to into the microphone input of the other transmitter and keys that transmitter.

3) When listening to a station on the other band, he pushes a button and reverses that process. He may interrupt this back-and-forth flow at any time simply by keying his microphone.

If this all sounds like a manually-operated repeater, you are *almost* right; however, there are some very important differences. A little background will help to explain how this new operating technique emerged.

Background

For the past five years, I have had the pleasure of conducting the East Coast Apple Net on forty meters. Every Saturday morning we gather at 9 am eastern time on 7260 kHz to chat about computers in general and Apple computers in particular. This has proven to be a very popluar net since so many hams are also computer enthusiasts. Because of the general popularity of computers, I have known for a long time that we have a "lurking," voiceless audience of people who have an abiding computer interest but no amateur license. There are also many licensed amateurs who do not have low-band privileges.

"Why not," thought I, "conduct the net on *both* 40

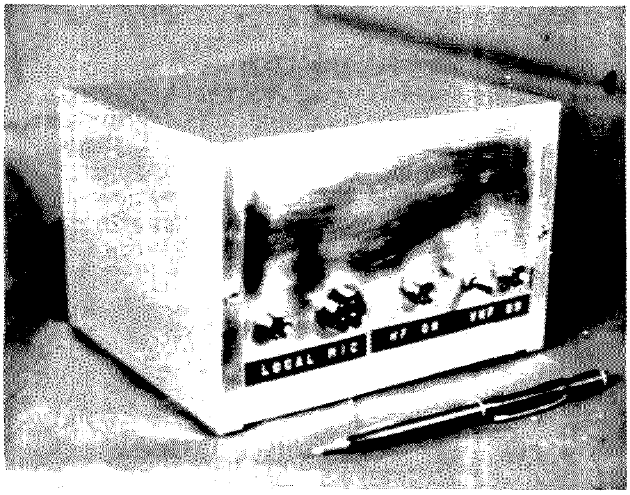

Photo A. Front view of the logic box.

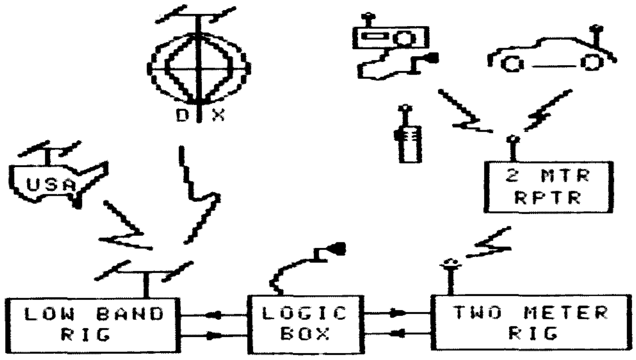

Fig. 1. Diagram of how crosslinking works.

meters and 2 meters and thereby enable a wider participation in the net?" There did not seem to be any technical reason standing in the way of this evolution. Crossband operating is as old as amateur radio itself, and I had all the hardware (almost) necessary to try it. Just one experiment with holding microphone to loudspeaker showed two things: (1) It had great possibilities, and (2) a missing black box was needed to make it work properly.

That was the generating force for the "logic box," shown in Fig. 2. More about that later. There was another consideration which might offer a much greater handicap to carrying out this idea. It's called "FCC rules and regulations." Amateur Extra class licensees would have no problem with any conceivable permutation of operating frequencies, but how about lower-class licensees? If it were illegal for a Technician to join the net on two meters and have his voice heard on forty meters, then I was just spinning my wheels with further conjecture on this idea. It obviously was time to go to the horse's mouth.

Conversation with the administrators of amateur operations at the FCC in Washington completely dissolved any apprehensions I had about the proposed operating procedure. All amateur participants would be licensed for the frequencies upon which they were transmitting and over which they had control. All conversation relayed by my facilities was clearly covered in the definition of what I was licensed to transmit. I was not proposing a repeater-type operation, which would be both illegal on the low bands and which would allow lower-grade licensees to control emissions on frequencies for which they were not licensed. Surprise, surprise! No bureacratic ground-breaking was involved! I was, in fact, sent on my way with an encouraging endorsement for trying out a new operating technique. Who says the bureaucracy is never administered with good judgment and understanding!

So, the decks were cleared for action. But there was still the problem of how to oversee the net and to control the flow of transmissions. The three points defined above seemed to describe all the elements of the technique that I was looking for. I wanted to be able to switch the audio to flow in either direction from one band to another at any time. I felt that a little momentary toggle switch would allow me to perform that function best. And I wanted to be able to break into the transmission pattern at any time with my voice, so my microphone switch should override whatever mode was going on. One other corollary mode comes about from pushing the mike button. When I finish talking, *both* rigs default to the listening mode so that I can monitor both bands at any time.

Hardware

The circuit necessary to control both rigs turned out to be a little more complicated than I had thought. Fig. 2 shows the result, which I have called the logic box. Three relays are involved, one for each band control plus a third relay for my microphone keying and to provide latching for the other two relays. Since the logic of the operating called for a momentary switch closure to *open* rather than close the ground circuit of the latched-up relays (a logic negative), I inserted a simple transistor switch to invert the mechanical switch logic. Thus, either latched-up relay RY1 or RY2 can be dropped by operating the transistor switch through SX1 or by removing the latching voltage by closing the push-to-talk switch on the microphone and dropping RY3.

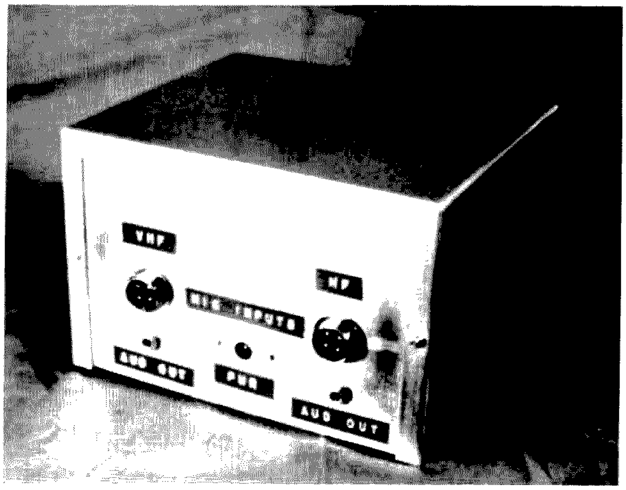

Photo B. Rear view of the logic box.

The LEDs were put in to remind me of my last official act and clearly remind me of what the current transmission flow was. Relays were used because the widespread variation of keying methods for the current crop of transceivers is enormous. Varying polarities and voltages are made totally irrelevant by the good old relay. I can use the logic box with any transceiver I can lay my hands on.

Photos A and B show the front and back of the logic box. The inside is a typical prototype mess (so I won't let you in), but it all works exactly as planned. I decided to use the "standard" four-pin microphone connector used by so many transceiver manufacturers and readily available at Radio Shack. The speaker audio is bridged from the transceiver at the auxiliary audio-output jack and fed into the logic box through the mini-jack connector. Power for the relays is provided by any 9-12-volt calculator-type power supply that can furnish on the order of 200 milliamperes.

I was concerned about the varying levels of audio among the microphone and loudspeaker outputs. This turned out to be a reasonable concern. My first attempt was just to "brute-force" the audio through and see what happened. It worked, but not well. Here's what I had to do.

No ordinary microphone seems to be up to the task of feeding two rigs at once. The main problem is the widely varying input impedances of various transceivers plus the generally low output of most microphones. The solution for me was an amplified Astatic D-104 microphone. The power amplifier in this microphone turns the mike signal into a relatively

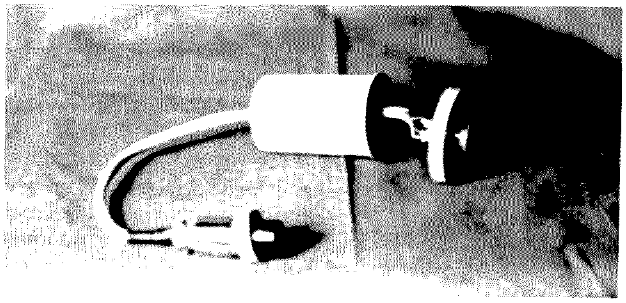

Photo C. The mini-jack connector.

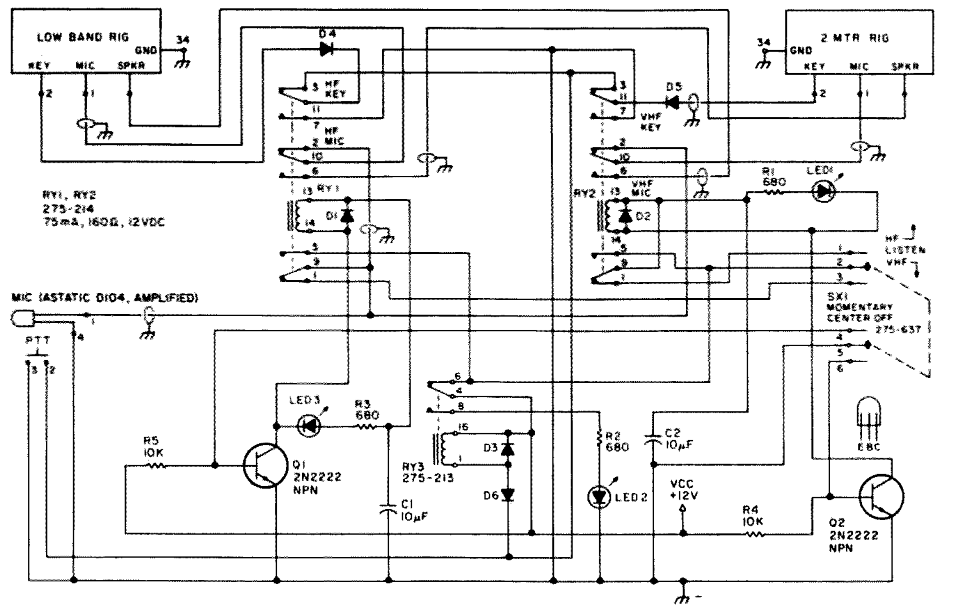

Fig. 2. Schematic of the W1UKZ logic box.

low-impedance output with some power behind it. Since the impedance of the microphone amplifier is lower than *either* transceiver mike-input impedance, there is plenty of audio available for each. Most two-meter transceivers have very efficient agc circuits in their mike-input circuits so I did not have to monitor that signal input. The low-band rig I am using (an Atlas 210X) gives me meter monitoring of the audio input and a gain control to manually adjust it.

Experience proved that the audio levels needed just a little more balancing. I wanted to be able to set the loudspeaker levels for each rig for comfortable listening and to have that be about right for the mike inputs. In my case, this meant padding down the audio from the transceivers rather heavily. I cobbled up some loss-pad cables, consisting of my standard four-pin microphone connectors and mounting the male end, normally living as a chassis-mount configuration, on the plastic cap of a discarded 35mm film container. (See Photo C.) Inside the container is a 560k-Ohm resistor in series with the hot audio lead, providing the necessary padding. Holes for the cable and connector take about ten seconds to make with a Princess soldering iron! Of course, I could easily have inserted the padding resistors inside the logic box, but this would have limited the universal nature of coupling the box to my rig configuration. For me, putting the pads in their own junction cables was best.

One other hardware consideration doesn't appear on the diagram. My next box will have a simple switch to disable the keying lead to either rig. This will make it unnecessary to disconnect the 2-meter input when I want to key only the low-band rig. Since I am using SSB on low bands, switching off the signal to the low-band rig is as simple as turning down the mike gain control. That facility is not available on two-meter transceivers.

One other hardware consideration should be mentioned. I discovered that almost *all* commercially-available two-meter transceivers have an unpublished duty-cycle specification. In my case, with the Kenwood TR-7800, it is three minutes of transmitting followed by one minute of listening. To transgress on that specification is to run your rig *very hot*—hot enough to do damage to the final transistor stage. This is true even at low-power options. In crosslink operations, transmissions longer than three minutes are commonplace, so a fan was in order. A cooling fan directed at the heat sink of the two-meter rig totally solved this problem. All those RTTY enthusiasts should note this potential problem since two-meter RTTY operating will certainly run into the same condition.

Operating Experience

So, how does it work? On the net operations it was an instant success. The net immediately acquired a handful of stations not previously heard from. In addition, many comments from other hams who, although not inclined to join the net by announcing their presence, found it very convenient to be able to go about their Saturday morning chores while carrying around a handie-talkie to monitor the proceedings of the net. Of course if they were so inclined, they could break in at any point to make their comments heard.

The real excitement for this operating mode has come from an unexpected direction. Since I had the capability, I decided to explore the advantage of crosslinking for less formal purposes than net operation. Instant success!

The procedure used has been to find an under-used repeater and call "CQ DX." Of course, this conventional invitation goes out over both the low-band and two-meter frequencies. Some puzzlement is expressed by two-meter listeners who hear "CQ DX 20" and suspect the contents of my coffee cup. An understanding quickly ensues, however, and before you know it, there is a round table under way on the two-meter repeater involving one or more DX stations. The excitement generated by this technique was wholly unexpected.

The first comments came with wild enthusiasm from Technicians who suddenly found themselves able to experience the pleasure of DX operations for the first time. With this occasional taste of upgrading experience, they proceed with redoubled enthusiasm on the path of license upgrading. But General, Advanced, and Extra class licensees have been equally vociferous in their endorsements. As explained to me, there is something really neat in being able to walk on the beach with a handie-talkie and chat with a Russian amateur near Moscow! The two-meter mobilers, on the way home through dismal traffic conditions, also are excited about working on their DXCC while engaged in stop-and-go traffic.

And the DX stations! Well, they stand in line just waiting for an opportunity to join the crosslink. Operationally, I have tried to encourage more than one DX station at a time, if the DX stations can hear each other, so that the benefits of two-meter round-table conversation may be employed.

Parts List

Quantity	Item	Description	Radio Shack #
2	RY1, RY2	4PDT relay, 12 V dc	275-214
1	RY3	SPDT relay, 12 V dc	275-243
2	Q1, Q2	NPN transistor	276-1617
1	SX1	DPDT switch, mom.	275-637
3	LED1, 2, 3	Indicating LEDs	
3	R1, R2, R3	680-Ohm resistor, 1/4 W	
2	R4, R5	10k-Ohm resistor, 1/4 W	
2	C1, C2	10-uF, 15-WV capacitor	
3		Microphone socket	274-002
2		Microphone plug	274-001
3	D1, D2, D3	Diode	276-1620
1		16-pin DIP socket (for RY3)	
2	Socket, RY1, 2	Relay socket	275-221
1		12-V-dc power supply	273-1652
1		Power-supply jack	274-1549
2		Audio jack, 1/8"	274-253

A typical drive-time round table recently found stations in Northern Ireland, England, Holland, Italy, Corsica, and Central Nigeria in a round table with five or six two-meter mobile stations on their way home from work! Another time found a one-Watt mobile station in Portsmouth, New Hampshire, talking with a station (ONØ) in the Aland Islands off the coast of Finland. His route was via a two-meter repeater in New Hampshire to my station on the south shore area in Boston, over to Europe. Not bad for one Watt!

The permutations of this technique are probably already cycling through your mind. The band combinations obviously are not limited between just 20 meters and two meters. And rag-chews don't have to involve only DX stations. How many different ways can *you* think of which might have lots and lots of good amateur radio fun involved, while at the same time challenging us to develop new hardware and operating techniques? How about different operating modes from just voice transmissions? A mixture, maybe . . .

New Techniques and Considerations

Here are some things I have learned already and some things that are as yet unresolved:

● Two-meter and DX-band operating procedures differ markedly. Two-meter operators use a speech-shorthand technique which needs modification when DX stations, some with limited English capability (and with some QRM and QSB problems thrown in), get added to the two-meter round table. DX stations seem very, very interested in the everyday experiences commonly discussed on two meters but rarely mentioned in DX conversations. Two-meter operators need to be clear in identifying their stations, using phonetics for their callsigns when necessary.

● Depending upon the skill of the operator at the host crosslinking station, rapid conversational gambits, common to two meters, can be employed. I think this type of exchange should be encouraged, but time will tell.

● Crosslink operators must be very careful not to allow transmission by unlicensed persons to enter the crosslink when stations in countries not supporting third-party traffic are involved. Since this is a brand new operating world for many Technician licensees, they are often unlikely to remember third-party proscriptions.

● All crosslink operators should keep very complete logs. This is not required by any FCC rule or regulation; it is simply to be able to reconstruct what went on for purposes of QSLing and other record keeping. How the rest of the world views the establishment of DX records for recognized purposes is yet to be established. At least one ham has started his own path toward DXCC via crosslinking.

● Amazingly enough, this technique both serves to conserve frequencies on the crowded low bands and provides new opportunities to develop greater employment of lesser-used bands, such as six meters. Clearly, six DX stations and six two-meter stations employing only one low-band frequency and two two-meter frequencies is band conservation. If the VHF frequency were on six meters, then the other part of the new equation would also be true.

● All is not just sweetness and light when new operating conditions appear. Those stations who like two-meter-repeater operation the way it is may object strenuously to a new idea which invades their otherwise untrammeled domain. Crosslink operators can expect to be invited off some repeaters. Crosslinking *can* use up a lot of repeater time, and those areas where repeaters are in short supply can anticipate even greater discussion about how repeaters should be employed. Maybe repeaters will need to be established primarily for crosslinking. Crosslinking on direct VHF frequencies needs to be developed.

● In the same vein, the cordial atmosphere which normally exists on repeaters during drive time needs to be conserved. When a crosslinking control station connects with a low-band station who wishes to crosslink, what happens? If there are stations on the repeater waiting to chat, all well and good. But suppose that two-meter connections have not yet been established? What then? The crosslink control station needs to assess carefully how courteously to enter a two-meter repeater with a DX station tagging along. Sometimes, two-meter stations just don't want "foreign" stations to enter their discussions and are not prepared to modify their technique to accommodate language and listening difficulties. How to establish a new operating protocol for this new ham radio technique needs to be discussed.

Crosslinking, I suspect, may become one of the most exciting operating techniques to be adopted since the entrance of single sideband. It comes with great opportunities and a variety of operating procedures yet to be developed. It does *not* require *any* new hardware developments. *You* can begin crosslinking as soon as you return from your local Radio Shack store with less than $20 worth of parts. If that doesn't make this idea pretty exciting, I don't know what will! ■

Grenada Log

With a body-bag rig and gas from a bike, a ham hustled home the news. Here's history happening.

Bob Cunningham K1XR
PO Box 214
Fitzwilliam NH 03447

Tim Daniel N8RK
PO Box 485
Peterborough NH 03458

"An invasion on 20 meters?" Those were the words Steve Mendolsohn WA2DHF heard with disbelief when he answered the telephone at a little after six on the morning of Tuesday, October 25th, 1983. Over 2000 miles away on the island of Grenada, Mark Baratella KA2ORK had been up for three hours, making ham radio history. Operating from his second-floor room at the Grand Anse campus of Saint George's Medical School, Mark had become an essential link between the island and the rest of the free world.

This was how and where it began: The social and political events leading up to the rescue mission on Grenada are well known. In the days prior to October 25th, ham radio played an important but not a primary role. That all changed, however, when Mark was summoned by medical school administrators. With phone service nonexistent, the telex dead, and the extremely unusual sound of aircraft circling overhead, Mark swung into action.

His ham gear, which had been dismantled and hidden after the days-old coup, was retrieved from its hiding place—a body bag in the school's anatomy lab. Five minutes later, KA2ORK/J37 was calling CQ on 20 meters. No response . . . the band was dead. Thankful for having a five-band trap dipole, Mark made a quick change to 40 meters. Tuning across the quiet band, he happened onto an early morning QSO between an operator in Texas and a K4 in Georgia.

"Break . . . Emergency . . . Break!" Naturally, the reaction was skeptical. By now Mark was hearing antiaircraft fire in the distance. After confusion about third-party agreements was laid to rest and it was established that this was a true emergency—not a late-night bootlegger—the K4 telephoned Dr. Steve Lomazow N2DRA, Mark's QSL manager.

Due to the conversations of preceding weeks, Dr. Lomazow was more than aware that such a phone call might happen. The 40-meter frequency, however, caught him by surprise. Enlisting the help of his wife and son, Dr. Lomazow soon had a dipole connected to his rig, hastily set up near the dining room phone.

The predawn path between New Jersey and Grenada was a good one, but to ensure top-quality signals, Dr. Lomazow enlisted the aid of KC2PK, whose directional antenna and one-thousand-Watt transmitter were put on the air. There was little hesitation . . . KC2PK's daughter was on the island.

Mark told Dr. Lomazow that there were rumors of an invasion and asked him if he could confirm it. N2DRA's phone calls to CBS, NBC, and ABC turned up nothing. (By now conditions on 40 meters were deteriorating. The group moved to 20 meters where they set up shop on 14.250 MHz.) However, tipped off to the fact that something was happening in the Caribbean, the networks began to investigate.

Enter Steve Mendolsohn WA2DHF. His first reaction to the awakening phone call from his office, CBS Network Operations, was, "Your average invasion does not take place on 20 meters!" But after tuning in 14.250, Steve quickly changed his mind.

During KA2ORK/J37's transmissions, listeners now could not mistake the distinct sound of small-arms fire and jet aircraft. According to Steve, "It was beginning to sound like there was someone who was not just down vacationing for a DX contest!" As the word got out, hams who were close to the media were besieged with phone calls. For example, Steve logged 46 such inquiries.

As it grew light outside, in Grenada, one of Mark's fellow students used his previous military experience to monitor the activity around them. From this rooftop crow's nest, he began to identify the ships just off the beach and the aircraft overhead as belonging to the USA. Even though they were in imminent danger, Mark and the students were fascinated by the technical

expertise of the military in action.

To augment the information that they were receiving from official sources, the press desperately wanted to speak with someone on the island. With the phone and all other forms of communications dead, again, the only alternative was ham radio. Mark was inundated with on-the-air requests from the international, national, and local US media and amateur operators who were assisting the media. He refused all interviews, going so far as to deny Dan Rather any comments. (After Mark returned home, he met Mr. Rather and explained the situation and how ham radio functions.) What Mark did was to report nothing but facts. He told only of events that he could see himself or were reported to him firsthand from spotters on the roof.

Shortly after Mark started operating his Swan 500, the area lost commercial power—not an unusual event on a small Caribbean island. Prepared for this, the school had a diesel-powered generator on standby. Risking nearby gunfire, a few students made their way across campus to the generator. They fueled it, checked the oil, and started it. It had oil, but there wasn't any in reserve and it was running low. It ran for almost 18 hours before freezing up. As a last resort, they had a small Honda generator of about 500 Watts capacity. Mark put the new generator out on the balcony and started it up. After reducing his power, he started to transmit. Every time he keyed the mike, the underpowered generator groaned. However, it did the job; on-the-air signal reports were unchanged. They had enough gasoline to operate this power supply for an additional 5 to 10 hours.

It was actually needed, however, for only 3 more hours. At that time: "It's Now! . . Get Down! . . Get Down Now!" Those were the words one of Mark's friends used when he was instructed to get him from his second-floor "shack." The Rangers were there and it was time to evacuate. Mark pulled the plug and headed downstairs. The rescue helicopters were arriving at the beach, four and five at a time. A line of Rangers pushed the students down the beach and into the awaiting choppers. Mark wished that he still had his rig operating, as mortar fire was coming in and the helicopters were firing their cannons back to protect the students. Over 200 people were evacuated in about 15 minutes.

After a short flight to the recently-secured airport, the group had a few hours to collect their thoughts before being flown by jet to Barbados. On Barbados, Mark was able to phone home. After reassuring his family, topmost on his mind was letting the amateur-radio fraternity know that they were all safe. Another quick plane ride to South Carolina, and the ordeal was over.

Mark's overall impression of the entire operation was reassuring. Amateur radio proved itself again. Yes, there was malicious interference. There was also interference which was the result of some well-intentioned but nonetheless frivolous transmissions.

Licensed since his late teens, Mark epitomized the important role that young people can play in amateur radio. For KA2ORK/J37, WA2DHF, N2DRA, KC2PK, and countless others, the day 20 meters was invaded will not be forgotten soon.

The authors would like to thank WA6ITF, N2WS, WA2DHF, N2DRA, and last but not least, KA2ORK for help in researching this story.■

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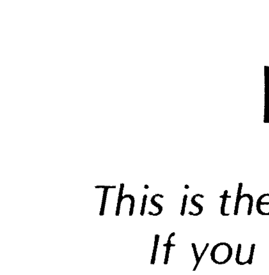


Fig. 1.

Feeding any number of coax cables through a window from the ham shack to the antenna farm is sometimes a problem when the window has to be kept open a slight amount to allow clearance for them. Not only does rain blow in at times, but during the winter a tremendous amount of heat can be lost through such gaping gaps—not to mention insect invasions in the summer.

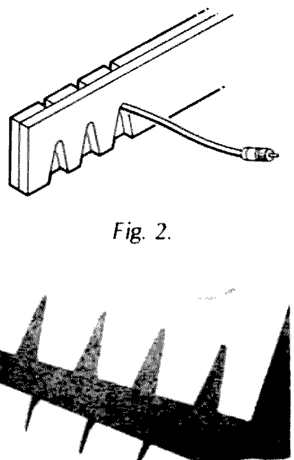


Fig. 2.

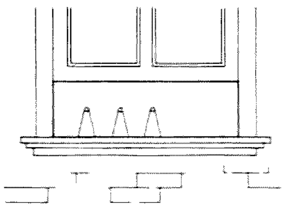
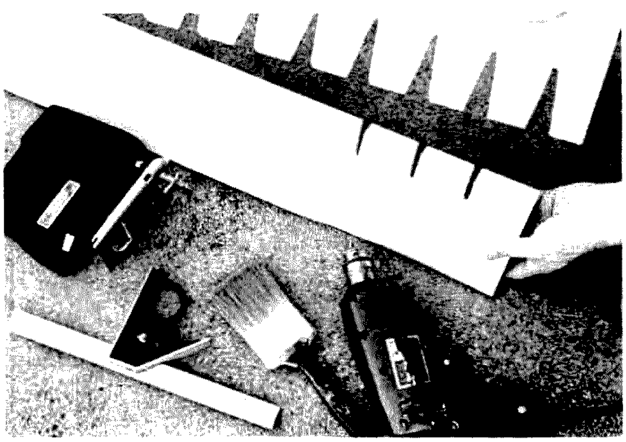


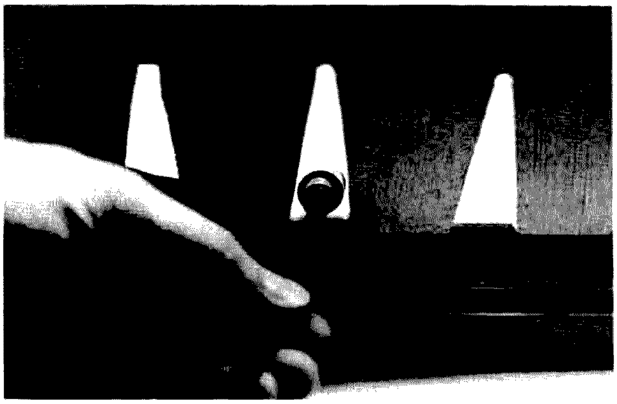
Fig. 3.

Some have taken it so far as to make a permanent installation, such as drilling holes in the side of the house, running the cables out, and then filling the holes with a weather-resistive material. That's good for home *owners* only.

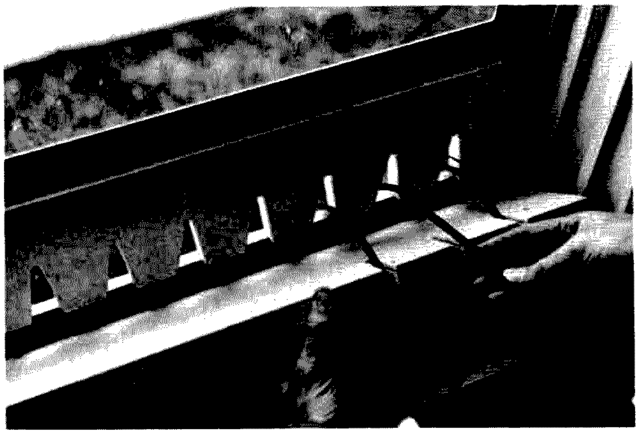
An easier and much less



Tools needed, and finished boards.



Inserting connector through outer board.



Guiding lines through inner board.

defacing method is to cut a board the same width as the window and close the window as far as possible down onto the board to make a tight fit. When a cable needs to reach outside the shack, a hole is simply drilled in the board and the cable is brought through.

With this method, I have found that almost every time I want to run a cable out the window the cable I have chosen to use inconveniently has connectors on both ends. Since a tight fit and a good seal requires that the hole in the board should be only large enough for the cable itself, that means that the connector has to be cut off before the cable can be inserted into the hole or removed from it.

However, by looking at the illustrations you should have no trouble in understanding the method I have found which facilitates a weather-tight seal and easy insertion or removal of any size cable without having to remove the connectors.

The method employs two boards cut to the width of the window. The boards are sandwiched together and the window is closed down onto the boards. Each time a new feedline must be brought through, just drill a hole in the center of the two boards and cut slots from the holes to one edge of each board. The slots are cut in opposite directions in the two boards so that the board which faces the outside has its slot going down and the board facing inside has its slots going up.

The slots in the outside board should be cut in a wedge shape so that when the inside board is moved out of the way, the connectors on the cables can pass through the wider end of the slots without having to remove the outer board at all. This way you can seal the outer board by caulking it or using duct tape and thus the board never has to be removed. This requires several holes and slots to be pre-cut in the outer board before it is fixed in place.

When any cable is removed, the small hole that is left behind can be filled easily with a small dab of putty, a piece of wood dowel, or cloth.

This method works well not only for coaxial feedlines but for twin-line as well since the wood helps keep the twin-line away from any metal window framing which might have some effect on the impedance of the feedline. ■

Lines in; window weatherproofed.

Carl A. Kollar K3IML
1202 Gemini Street
Nanticoke PA 18634

Sound Off!

Here's the perfect S-meter add-on for the repeater that has everything. The higher the beep, the better the signal.

Think you've seen every kind of attachment to a repeater that there is? How about this one—an audible S-meter? If you're wondering about why in the world you would need an audible S-meter on your repeater, think about all the times that you wanted to compare rigs, optimize antenna direction or location, or just know how well you were making the repeater from a particular mobile location. If your luck was like mine, you found that no one was around at that time, or, if they were, they couldn't stay while you fiddled around with your rotator or carried the antenna back and forth across the roof a bunch of times. And even if they did stick around, didn't you ever wonder how they could determine by ear whether you were 70% or 80% full quieting?

Well, this little circuit will solve all those problems for you. Now you can make any of those tests all by yourself and know for sure whether that last change you made helped or hurt you even if no one's around. Generally, what it does is sample the first limiter voltage, amplify it, and feed it to a voltage-controlled oscillator which returns a beep proportional to your signal strength. The higher the beep, the stronger you are (up to full quieting). I've got mine on WR3AGU 147.81/.21 at Mehoopany, Pennsylvania, and it's been working great for about a year. It's set up to give a continuously variable tone beep between .2 uV and 1.0 uV. The tone frequency range is 800 Hz for .2 uV and about 2800 Hz for 1.0 uV.

All the other junk you see in the schematic diagram does things like delay the beep to give your receiver time to recover after transmit, set up a sample-and-hold circuit to hold the limiter voltage momentarily when you let up on the mike, and discharge that voltage after the beep is output, etc. More on that later in the circuit description. Depending on where you hook it up on your repeater, it can serve a dual purpose of indicating timer reset and signal strength.

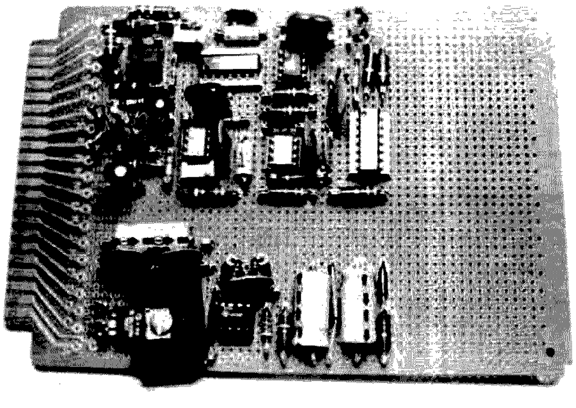
The circuit isn't very complex and it shouldn't be hard for anyone with the time and initiative to design a PC board for it.

Circuit Description

IC1 is a dual op amp with a very high input impedance. This is necessary so as to not load down the first limiter stage to which it will be connected. The gain of the stage is variable and is adjusted by the 1-meg-dc amp gain control. More about this adjustment later. The output of this IC is fed through D1 to the second half of IC1. D1 ensures that the 2.2-uF tantalum capacitor is not discharged when the output of IC1a goes lower than the voltage on the 2.2-uF capacitor.

These components form a sample-and-hold circuit which holds the voltage developed by IC1a for a short time when the input signal disappears. IC1b serves as a voltage follower/impedance transformer. Its high input impedance does not load down the 2.2-uF capacitor and its relatively low output impedance feeds the MC4024 vco. The MC4024 is a voltage-controlled oscillator. The audio output frequency of this chip is deter-

Photo by Mike Benish K3SAE



Circuit board.

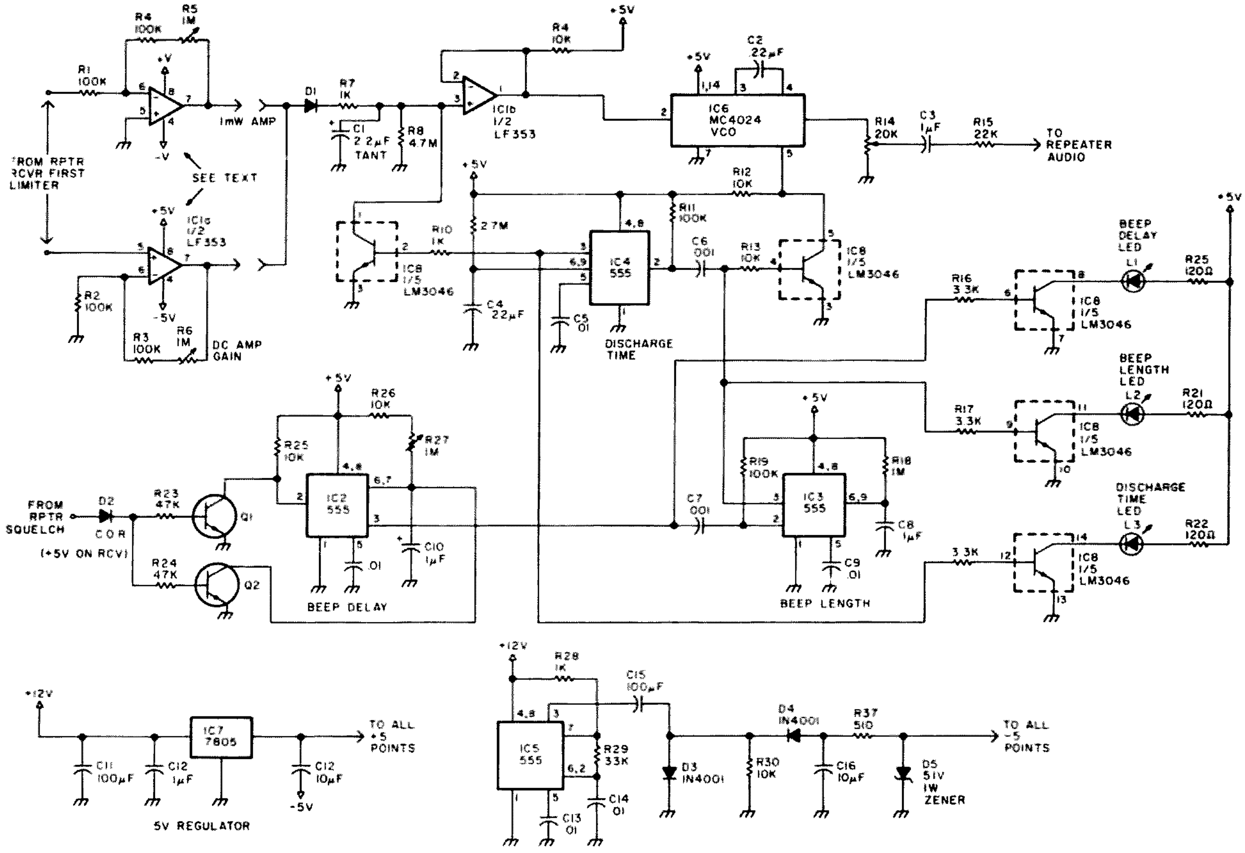


Fig. 1. Schematic.

mined by the voltage at its input. With the values shown, output frequencies between 800 and 2800 Hz will be generated when pin 5 is high.

The repeater COR is connected to the anode of D2. The COR must go above 2.0 volts on receive and remain below 1.0 volt when idle. The standard 0-volt low and 5.0-volt high is ideal. When a signal is received, IC2 (set up as a retriggerable monostable) is reset and its output is held high while a transmission is being received. When the received carrier disappears, IC2 then times out (how much later is determined by the 1-meg pot and the 1-uF capacitor) and output pin 3 goes low. This delay is to ensure that you release your mike button. Instead of an immediate return beep, a delay is introduced which allows time for receiver recovery.

When IC2 goes low, it triggers IC3 which is set up as a monostable. When pin 3 of IC3 goes high, it biases on the B section of the LM3046 transistor array, bringing pin 5 of the MC4024 vco low for a finite time allowing it to output a beep. After IC3 times out, its output pin 3 goes low, shutting off the vco and triggering IC4. When IC4 is triggered, its pin 3 goes high and biases on the A section of the transistor array. This discharges the 2.2-uF tantalum and readies it for receipt and storage of the next voltage level.

The other three sections of the LM3046 transistor array are used, together with their respective LEDs, as logic monitors to indicate the status of the three timers. All five sections may, of course, be replaced by five discrete transistor devices if you wish.

The fourth 555 is used in the astable mode to convert +12 volts dc to a low-current −5-volt supply needed for the proper operation of IC1. The 7805 is a three-terminal device used to regulate the +12 volts supplied to +5 volts needed for IC1 and other portions of this circuit.

Adjustment

There are only three adjustments to be concerned with. The one-meg pot associated with IC2 is adjusted to provide the amount of delay you would like after the carrier disappears before the beep is heard. The proper amount of time is what sounds best to you. Adjustment is best done while in actual operation.

The one-meg-dc amp gain associated with IC1a takes a bit more to adjust. If you have access to a Cushman or other service monitor with a calibrated output, things are much easier.

With a service monitor: (1) Remove the LM3046 from its socket (you did use a socket, didn't you?). Short pins 5 and 3 of the socket with a thin jumper wire to permanently enable the MC4024. (2) Disconnect one end of the 2.2-uF capacitor. (3) Set the dc amp gain to minimum resistance. (4) Key up the repeater and adjust the 20k-level pot in the output of the vco to about 3-kHz deviation. (5) Apply a signal to the receiver which is just enough to break squelch. Adjust the dc amp gain slowly until a slight rise in tone pitch is noticed. This causes IC1a to output the dc level at this point which is needed to begin controlling the vco. Any larger signal will be further amplified and applied through IC1b to the vco, resulting in a higher tone from the vco. The stronger the signal, the higher pitched the tone.

Without a service monitor: (1) Perform steps 1, 2, 3, and 4 above. (2) Have some-

one with a very weak signal transmit. Adjust the dc amp gain as described in step 5 above.

The Input Stage

IC1a's input is connected to your repeater's first limiter stage. The voltage at this point will most probably increase with an increase in signal strength. In this case, the non-inverting stage configuration is used. If it is necessary to connect to a point in your first limiter where the voltage decreases with increasing signal, then use the inverting configuration shown.

The audible S-meter has proven to be a worthwhile addition to the 81.21 repeater (WR3AGU) and I'm sure you'll find it a useful and novel feature on your repeater.

I'll be happy to answer any questions regarding this circuit. Please include a stamped self-addressed envelope. ■

Parts List

Resistors (all ½ or ¼ Watt unless stated otherwise)

R1, R2, R3, R4, R11, R19		100k
R5, R6, R27	part # TR11-1 meg $.39	1 meg pot
R7, R10, R28		1.0k
R8		4.7 meg
R9, R12, R13, R25, R26, R30		10k
R14	part # TR-11-20k $.39	20k pot
R15		22k
R16, R17		3.3k
R18		1 meg
R20, R21, R22		120
R23, R24		47k
R29		33k
R31		510

Capacitors (all capacitors at least 12 volts dc)

C1	part # TM2.2/35	$.51	2.2 uF tantalum
C2, C4	part # MY.22/100	$.33	.22 uF
C3, C10	part # A1/16	$.17	1.0 uF
C5, C9, C13, C14	part # DC.01/50	$.08	.01uF
C6, C7	part # DC.001/50	$.08	.001 uF
C8	part # DC.1/12	$.12	.1 uF
C11, C15	part # A100/16	$.24	100 uF
C12, C16	part # A10/16	$.17	10 uF

Diodes

D1, D2, D3, D4	part # 1N4001	12/$1.00	1N4001 or equiv.
D5	part # 1N4733	4/$1.00	5.1 V zener

Integrated Circuits

IC1	part # LF353N	$1.00	LF353
IC2, IC3, IC4, IC5	part # NE555V	$.39	555
IC6	part # MC4024P	$3.95	MC4024
IC7	part # LM340T-5	$1.25	7805 regulator
IC8	part # LM3046N	$1.30	transistor array

Transistors

Q1, Q2	part # 2N3392	4/$1.00	general purpose NPN type

LEDs

L1, L2, L3	part # XC209R	5/$1.00	general purpose LEDs

All parts available from Jameco Electronics
1355 Shoreway Rd.
Belmont CA 94002

Jim Willis WA4CCA
18456 Overlook Rd.
Los Gatos CA 95030

Some Alarming Techniques

These burglar-proof circuits will stump second-story men and amaze possible thieves—as well as you.

The most cost-effective way to protect life and property against fire, theft, and vandalism is with an electronic alarm system. Wayne Green has been telling us for years of the market potential for amateur radio operators in the alarm business. Having once been in the alarm business, I agree with Wayne and in this article I will share the common circuit techniques and a schematic for a simple but sophisticated residential alarm control panel.

Closed Loop or Open Loop?

For an alarm to be reliable, its operation must not be defeated by a loose connection or broken wire in the system. Most intrusion alarms use a closed loop—a continuous loop of wire with normally-closed switches wired in series. When one of the switches is open or the metallic tape on a protected window is broken, the alarm panel responds to an open circuit on its input terminals. This type of loop is self-testing; there is only one way to make up the loop, this being with all switches closed and wires connected. Fig. 1 illustrates an example of a simple alarm control panel circuit for closed-loop operation.

An open loop consists of a chain of normally-open switches wired in parallel. Some technique for testing the integrity must be provided, since a break in the normally-open loop would render part of the loop inoperative.

Fig. 2 illustrates the use of an end-of-line diode to monitor a normally-open loop. In this circuit an ac signal is impressed on the control-panel end of the loop. During one half of the cycle the end-of-line diode conducts, supplying current to the trouble relay. Should one of the switches close, the alarm relay would drop out, setting off the alarm circuit. Should the loop open or ac power fail, the trouble relay will drop out, alerting the operator to trouble on the

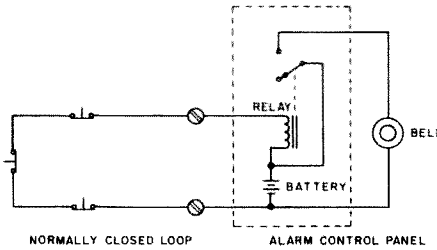


Fig. 1. Schematic of a simple closed-loop alarm using a relay, battery, and bell. The closed loop is self-testing because the loop must be made up before the alarm is turned on.

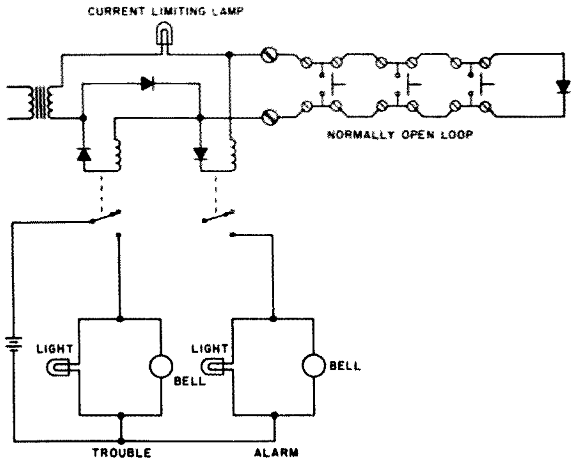


Fig. 2. Open-loop two-wire system, using end-of-line diode, relays, and ac power supply. These are used in fire-alarm systems.

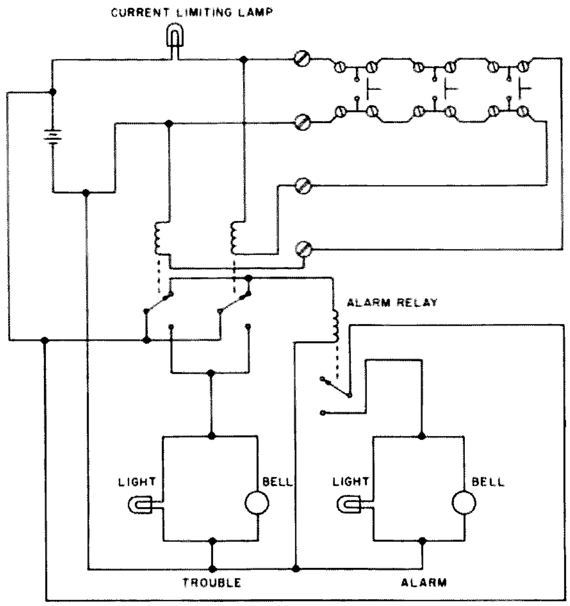


Fig. 3. Typical four-wire open-loop alarm circuit using alarm relay. These are also used in commercial fire-alarm systems.

line. There are other end-of-line techniques for detecting open-loop trouble; each has some problem and is considered not as good as a four-wire loop.

The Four-Wire Loop

A four-wire loop is shown in Fig. 3. This circuit uses two relays to sense the integrity of the loop. If either relay drops out, a trouble alarm is sounded. If the open loop is shorted, both relays drop out, as does the alarm relay.

This four-wire circuit uses a single dc power supply and may be supplied by a backup battery in case of ac power failure. It should be noted that in case of relay or power failure, this circuit will fail in the trouble or alarm mode. The normally-open switches used in this type of alarm have four sets of screws for the incoming and outgoing pairs to ensure that a switch does not get left out of the loop because of a poor connection. The open loop is normally used for fire-alarm systems which are left on continuously.

Entry and Exit

An intrusion alarm is usually turned off for part of the day and activated for part of the day. The operator must be able to turn the alarm system on and off without causing an alarm. There are two techniques for this: a high-security keyswitch mounted outside the protected perimeter and the time-delay system.

The high-security keyswitch technique uses a keyswitch with a cylindrical tumbler to bypass part of the closed loop, as shown in Fig. 4. To arm the alarm system, the operator first checks the integrity of the loop at the control panel and turns on the alarm. The operator then exits through the doors and areas bypassed by the outside keyswitch. After securing the exit door, the high-security keyswitch is opened, putting the bypassed switches back in the loop. To enter the protected perimeter these steps are reversed; first the outside switch is closed, then the operator proceeds to the alarm panel and turns the alarm off.

Entry and exit delays may be used in low-security systems where the intruder would not expect to find an alarm system, such as in a residence. When the system is turned on, the operator has a preset exit delay period before the alarm system is armed. This period is normally adjustable from a few seconds to a couple of minutes. This gives the operator time to set the alarm and exit the perimeter without setting off the alarm.

Another delay must be provided for entry. Here the operator may break the protected perimeter and still be given time to go to the alarm-system panel and turn it off before the alarm sounds. Obviously, the intruder may be given the same opportunity to find and silence the alarm before it sounds. Fig. 5 gives us a schematic for an alarm circuit which provides for entry and exit delay.

The entry and exit delays are fixed by the choice of timing capacitors C1 and C2 and resistors R10 and R11 connected to IC3; with 1 megohm and 10 μF respectively, the delay is about 14 seconds. This is about the minimum practical delay time.

Half sections of IC2 are connected as R-S latches to hold information about the system status. System status and loop integrity are indicated by LEDs. Also included is a power supply for the system with battery backup. Normally the batteries are dry cells which are tested and replaced periodically.

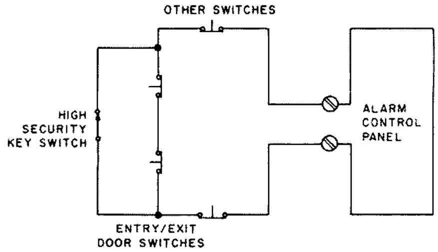


Fig. 4. Example of how a high-security keyswitch is used to bypass entry/exit doors. This type of circuit is used on commercial intrusion alarms.

Parts List

R1–R6	2.2kΩ, ¼-Watt
R7–R9	330Ω, ¼-Watt
R10, R11	1 megohm, ¼-Watt
C5, C6	4.7-uF tantalum
C1, C2	10-uF, 16-volt electrolytic
C3, C4	0.01-uF ceramic disc
D1–D3	1N4001
D4–D6	Light-emitting diode
S1–S3, S7	Normally-closed switches
S4–S6	Normally-open, momentary-contact switches
IC1, IC2	7400 quad two-input NAND; +5—pin 14, Gnd—pin 7
IC3	556 dual 555 timer; +5—pin 14, Gnd—pin 7
IC4	7805 5-V regulator
RY1	5-V low-current relay

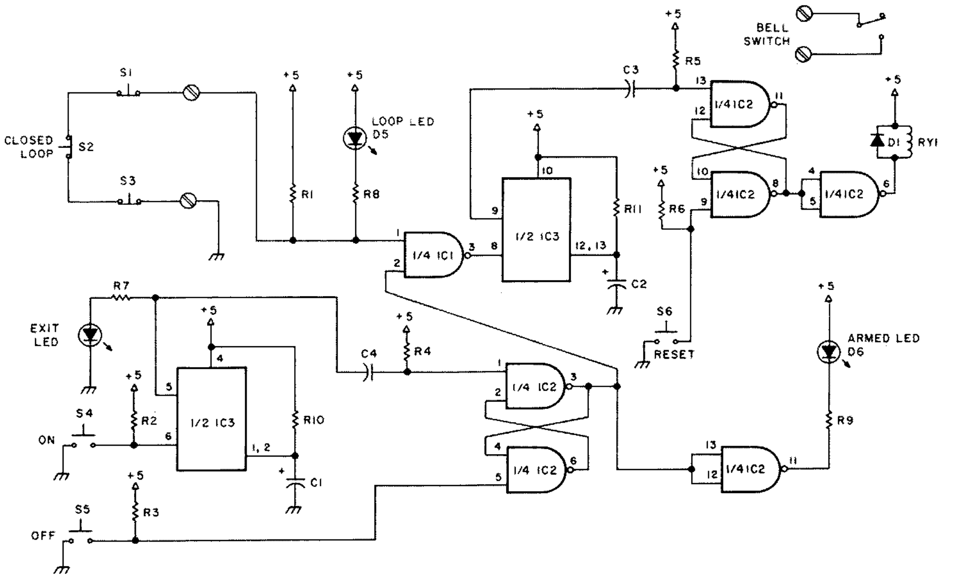


Fig. 5. Schematic diagram of an alarm control panel suitable for residential use. Entry/exit delay is included.

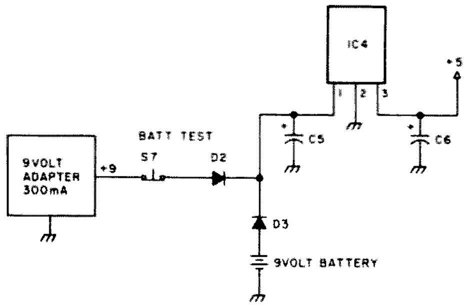


Fig. 6. Power supply for Fig. 5. The battery is usually dry cells which are periodically tested and replaced.

Summons

The systems described here all rely on a local bell to scare the intruder away and/or notify the occupants. Commercial alarms must also notify the police or fire department or some other private security office. Normally this is done over leased phone lines—pairs of wires leased from the phone company which connect the alarm panel to the central office.

In simple systems, a normal status is indicated by plus six volts dc, trouble is indicated by zero volts, and an alarm condition is indicated by negative six volts dc. In most locations, the exact nature of these signals has already been established and any new systems must conform to the existing standard. The central office receiver may vary from a plug-in zero-center meter, with latching relay and buzzer, to a small computer console which types out the name, address, and time of any alarm. Usually a small charge is levied for the use of the central system by the city or private company.

Parts Procurement

Commercial-quality alarm components are available from Ademco, Bourns, FBI, Moose, Napco, and Universal. These units are well engineered and built like tanks to provide years of trouble-free service. Residential-quality units are available from Midex, Seeker, Eico, and Solfan. Many of these have entry and exit delays and may not be suitable for commercial use. These are available from suppliers in many metropolitan areas.

Selling the System

For those interested in making a business out of selling and installing alarm systems, the thing being sold here is security, not a bunch of alarm panels, wires, switches, lights, and bells. The buyer wants to feel that he, his property, and his family are safe from fire, theft, and burglary. He wants his system to be reliable; if it fails to operate properly he wants it repaired immediately, even if it's 2 am. Once he has the security of an alarm system, he will not want to be without it. For this reason, alarms are usually sold with a service contract or lease. Remember: The customer probably won't know a thing about how his system operates.

There exists a good potential in many areas of the country for someone who can understand these simple circuits, organize a business, and be reliable in the installation and maintenance of alarm systems. For those not interested in a business, a do-it-yourself residential alarm offers a cheap, effective insurance against loss due to fire, theft, or burglary. ■

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Join the Packet-Radio Revolution—Part III

Don't mess up. Packet protocols and procedures are all-important, says WA7GXD, and he's been right so far.

Now that you have a background as to what packet radio is and what it takes in the way of hardware to get a packet station on the air, it is time to go into a little more detail on the communications protocols used in packet radio.

As mentioned in Part I of this series, protocol is taken to mean the formal rules governing information transfer. There are many different types of protocols used in amateur radio today. Every time you check into a net, there are procedures to follow. If you get involved in a roundtable discussion, less formal rules may apply. If you wish to use a busy repeater, there are, again, procedures to follow. In fact, any time you wish to communicate (and sometimes when you don't wish to!) there are rules. Some are formal, such as in parliamentary debate, while others are not.

In packet radio, the protocols used are designed to enable many users to access a given channel for point-to-point communication with maximum reliability. And since computers are used (the Terminal Node Controller—TNC—is a computer), the rules must be very explicit. Because computers lack judgment, all possibilities for confusion must be defined and worked out. Thus, protocol design is a *very* critical part of designing a packet-radio system.

Do other amateur digital-communications systems have defined protocols? The answer is yes! In RTTY, the 5-level Murray (Baudot) code is used in the United States, while in Europe the CCIR Alphabet Number 2 is the standard. Holding a marking tone between characters, unshift-on-space, data rate (60, 67, 75, or 100 wpm)—these are all part of RTTY protocol. In ASCII, the 7-level code itself is part of the protocol, and in amateur usage, most of the applicable RTTY standards have been carried over, including such things as 170-Hz shift and the 2125/2295-Hz tone pair.

As digital communications have progressed, more rigidly-defined protocols have emerged. AMTOR, perhaps the most sophisticated RTTY system in amateur use, has evolved as an error-reducing communications system and is defined in CCIR Recommendation 476-2. In commercial packet work, the International Standards Organization (ISO) has proposed a 7-layer model for packet-switching networks (see Fig. 1).

The first level, called the Physical Layer, deals with interfacing the user's terminal to the packet system. In the case of amateur packet radio, it is also the radio interface and the modulation scheme. While there is no standard in amateur practice at this time, there have emerged several de facto standards. RS-232 is the common interface between the packet system (usually a TNC) and the terminal. 1200 baud is the normal signaling speed on the packet side, using AFSK with 1000-Hz tone spacing using tones of 1200 Hz and 2200 Hz. Since there is no standard among amateur radio manufacturers for audio connectors or pinouts, no standard is possible for this physical interface.

The second level is the Link Layer. This deals with the actual format of the frames of information that make up a packet. It cares nothing for the data in the packet, but rigidly defines the address and control fields as well as the flags and the Frame Check Sequence (FCS). It is at this level that amateurs have come to agreement and adopted a standard called AX.25 level two. This protocol was first publicly proposed by AMRAD and adopted, with certain modifications, at a special meeting called by AMSAT in October, 1982. It was first put on the air by Tucson Amateur Packet Radio (TAPR) on the then-new TAPR TNC in December, 1982, and has since been coded into software for the Vancouver Amateur Digital Communications Group (VADCG) TNC by Hank Magnuski KA6M and others.

The next level, the Network Layer, is the focus of much experimentation today. When implemented, it will provide for inter-group linking as well as support multiple connections for, say, a roundtable with positive frame acknowledgment.

The functions of this level overlap somewhat with level four, the Transport Layer. It is the successful operation of amateur packet radio at these levels that will herald a new era in amateur-radio communications,

opening the way for an extensive, high-speed, highly-reliable communications network on a continental scale. Experiments with Phase IIIB, HF gateways, and the like are precursors to amateur level three.

The last three layers, Session, Presentation, and Application, deal with such things as CRT screen control, character sets, and the like. Amateur packet operation has managed to blur these areas with standard usage. For example, ASCII is the normal mode of character encoding. Bulletin boards are running at level two.

In fact, the definition of the digipeater function in AX.25 level two is actually a level three "kludge" to allow limited intermediate linking. This is not necessarily bad; it just shows that amateurs tend to adopt and adapt until things suit them for the unique environment in which we operate.

At the lowest level, an RS-232 interface has become the de facto standard for communicating between a TNC and a computer or terminal. The TNC looks like a modem (Data Communications Equipment, or DCE) while the computer or terminal is defined as Data Terminal Equipment (DTE).

A Protocol-Related Problem

Even at this low level, problems may arise. What if the receive buffer in your computer gets full, or the lines you are reading start to scroll off the screen of your terminal? What if the packet channel is so clogged that the transmit buffers in the TNC are getting full? These problems are solved by the application of a *flow-control algorithm* (computerese for a method of solving a problem—hopefully one that doesn't introduce other problems!).

Flow control is handled in the TAPR TNC by both hardware and software, although the software has to recognize the "hardware" solution.

In the case of the terminal (or computer—we'll use "terminal" to mean both) wanting to tell the TNC to stop sending data, the terminal may either (a) set the TNC's Request-To-Send (RTS) line false or (b) emit an X-OFF character (usually Control-S) to the TNC. In the first case, the TNC will immediately stop sending data to the terminal. In the second case, if the TNC has been told to, it will recognize the X-OFF character and cease sending data. Note that if the TNC is operating in a so-called transparent mode, only the hardware solution may be used, since in this mode the TNC passes all data, ignoring commands.

To resume data flow to the TNC, the CTS line may be set true (if the hardware control was used) or the X-ON character (typically set as Control-Q) may be sent to the TNC. (With the TAPR TNC, the X-ON and X-OFF characters may be user-defined and the default characters are given here.)

In the case of the TNC wanting the terminal to pause in sending data, it will set the Clear-To-Send (CTS) line false, returning it true when ready to again receive data from the terminal. Thus, flow control between the TNC and terminal is defined and provided for in the TAPR TNC "user interface" protocol.

The above discussion is a simple example of the sorts of problems that must be solved in defining a usable protocol for digital communications. While the details can become quite involved, the rest of this article will deal with the issues in a more general framework. The idea is not to make you an instant protocol expert but to give you some insight into the general workings of amateur digital communications with particular emphasis on the recently-adopted AX.25 packet-radio protocol. First, however, let's take a look at how amateur packet protocols developed.

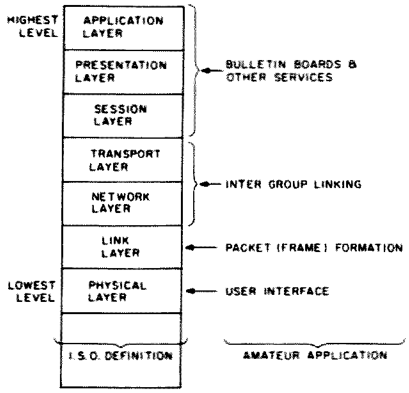


Fig. 1. ISO 7-layer protocol model.

Early Packet-Radio Protocols

At the risk of oversimplification, there basically are two ways of handling packet communications. One is to have a master-control station acting much like a net-control station in traditional amateur practice. The other is to have all stations equal, as in casual amateur operation. Not surprisingly, both methods have been used in amateur packet radio. Since the Canadians were allowed packet operation first, they implemented both first.

One system was developed in which a master-control station would *poll* each station in its list and each station would in turn pass along any traffic. The advantages are apparent: Everyone takes his turn and any potential conflicts in using the frequency are thereby resolved. The disadvantages are more subtle: How does one get on the list, and what happens if the list is long but only two or three stations are active? Do the few active users have to wait for the inactive stations to be interrogated by the master station between every transmission? And of course there may be a real problem if the master station goes down.

Another system was developed in which each station had its own identification and could attempt to access the channel at will. The possibility of "doubling" (called a *collision* in packet jargon) became real with this system, but communications were somewhat more robust because a central controller wasn't needed. And you didn't have to figure out how to get on the list.

The polling system is used in very few active packet areas now, and a variation of the second system became the de facto standard. Developed by the Vancouver Amateur Digital Communications Group, the Vancouver protocol spread with the VADCG TNC. Nearly all early work with packet radio in the United States was based on this TNC and protocol.

Features of the Vancouver Protocol

The Vancouver protocol allowed two stations to *connect* and carry on point-to-point communications with positive acknowledgment via a *handshake*. High-Level Data-Link Control—*HDLC* (see Part I of this series, September, 1983, issue of *73*) was used for assembling and disassembling packet *frames*, and Non-Return to Zero Inverted (NRZI, pronounced nurzi) encoding of the data stream was used to allow clock recovery, since HDLC is a *synchronous* pro-

tocol (as opposed to the *asynchronous* RTTY format with start and stop bits attached to every character).

In addition, this protocol allowed the use of a *digipeater* for allowing stations to connect that couldn't connect directly. A digipeater is similar in this respect to a voice repeater, although it is really very different. It performs the same Frame Check Sequence (FCS) on an incoming packet as any other packet station, rejecting those that are corrupted. It then generates a new, and slightly different, packet which it sends. The modifications are in the address (and possibly the control) field, much like the changing preamble in message traffic. The digipeater is thus more like an automated traffic-handling station than a repeater.

The Vancouver protocol also allowed a packet to contain multiple *frames* of information. Up to seven frames could be sent in one transmission, and the acknowledgment (ACK) would contain a number indicating how many frames were successfully received. This had the advantage of increasing the amount of data that could be sent in a given time period (called channel *throughput*) by reducing the number of times the channel had to be "turned around" to acknowledge receipt of data. At 1200 bits per second (bps), radio performance becomes the rate-limiting factor.

Finally, the Vancouver protocol provided for certain types of *supervisory* frames for control of the data link.

Unfortunately, there were problems, or more properly, limitations with the system. For one, only a single digipeater was allowed. What if two stations wanted to connect that needed two, or even three, intermediate relays? How could multiple stations exchange data and still get positive acknowledgment from the other stations? What if a station found itself in range of two digipeaters (overlapping networks)?

The greatest limitation, however, was in the addressing scheme. In conformance with commercial HDLC implementations, and to allow the TNC's HDLC control chip to screen incoming packets, a single-byte addressing scheme was developed. Due to part of the HDLC standard, only seven (7) bits are allowed in an address byte, meaning only 128 addresses can exist on a given channel. The digipeater had to share in all of this, certain address fields had to be reserved for various reasons, and the result was that a maximum of 31 stations could be on a given channel.

This may not seem like a problem since that would be a very congested channel, but the hardware used required that the station's special ID code be burned into the TNC's memory. Since not everyone in an area is likely to be on at any given time, 31 *addresses* can be very limiting because it then implies only 31 packet stations can exist in an area, active or not. What if a visitor comes into the area with the same address as a local? Who assigns the addresses? What if a person is in range of two or more networks, and his address is used in more than one of them? The list goes on.

Dynamic Addressing

At the time TAPR was forming, the protocol issue was taken very seriously. The hardware for the TAPR TNC has provision for changing addresses, and many other parameters, by inclusion of a *nonvolatile* memory chip that requires no battery backup yet can be changed by the user with a simple command (see Part II of this series, October, 1983, issue of *73*).

A protocol was designed that would have an "address server" to assign addresses to any stations that came on frequency. When the station checked out, its address would be removed from the active list, making room for other active users to join in. The "net-control" station would poll the users on the list from time to time to see if they were still on channel to prevent a station that had "died" from hogging an ID. The first station on a channel would become the address server, and this function could be passed on to any other station by command. Further, if a station detected the absence of the address server, it could then take over the function.

Finally, the address server would send out a broadcast message to all stations whenever a station came on or left the channel. This would allow a user to check the "system-status table" in his TNC to see who was on! It also would smooth the transition if the address server went down for any reason.

This *TAPR/DA* protocol is presently under continuing development and may be undergoing on-the-air tests by the time this appears in print.

Unfortunately, the protocol is fairly complex and the team implementing it in software has met with delays beyond their control. Further, adapting it to existing VADCG TNCs may be impractical without extensive modifications to that TNC.

AX.25 Level Two

In October, 1982, in conjunction with the AMSAT annual meeting, Tom Clark W3IWI called a meeting of the various packet groups to settle on some sort of level 2 protocol (the level at which the TNCs communicate with each other). The reason was very simple. With the successful launch of the Phase IIIB satellite, a digital-communications channel with predictable reliability would be available. If the various packet groups were all doing their own thing, a Tower of Babel would result with no two groups speaking the same language (protocol). This would result in either (a) chaos, or (b) extreme underutilization of the channel resource. Therefore, a common protocol had to be defined sufficiently in advance of the satellite launch to allow it to be coded in software and tested on the air.

Represented at the meeting were AMRAD (Washington based), PPRS (San Francisco based), SLAPR (St. Louis based), TAPR (Tucson based), and of course, AMSAT (also Washington based). New Jersey was also represented, and the groups' membership base covered most active packet sites. Unfortunately, the various Canadian groups were unable to attend.

Several proposals were espoused, with each group defending its particular approach(es) to the problem. Tom's strategy, essentially, was to lock everyone in a room with no departure allowed until agreement was reached. Surprisingly enough, it worked! What eventually emerged from the meeting was a modified form of the AMRAD AX.25 level-two protocol, which is an adaptation of the commercial X.25 packet-switching protocol, level two.

Essentially, this protocol provides for the various functions of the earlier Vancouver protocol with a number of additional features. Point-to-point connections are allowed, with positive acknowledgment of frames. Up to seven frames may be included in a packet. Flow control between packet stations is defined, so a receiving TNC may tell a sending TNC to stop sending traffic for a while (to prevent buffer overflow). A digipeater is allowed, and its functions defined. HDLC frames are

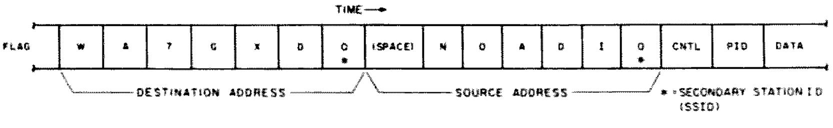


Fig. 2. Typical AX.25 non-digipeated address header.

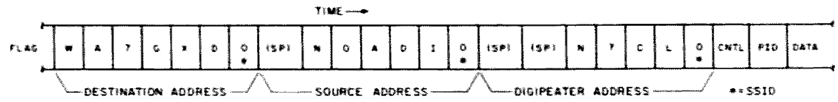


Fig. 3. Typical AX.25 digipeated address header.

used, with NRZI encoding and zero-bit stuffing.

The major differences lie in the addressing scheme. Whereas the Vancouver protocol allowed only 31 or so stations, the AX.25 system effectively allows over ten times the licensed amateur population to be active at once!

Why is this so important? Recall that the Vancouver protocol used single-byte addressing. The problem of a new packet station coming on channel becomes real when a channel exists that allows over 50% of the world's amateurs (theoretically) to have access at one time, as in the case of the Phase III satellite.

In AX.25, the amateur station callsign is encoded into a 7-byte field. This allows for a six-character callsign with an additional byte as a qualifier. This may be necessary when, for example, a packet station has multiple TNCs that must operate under one station call. This occurs fairly frequently, with some amateurs providing a bulletin-board service or a gateway station in addition to their "normal" packet station.

Both the sending station's and the intended receiving station's callsigns are in the address field, making it 14 bytes in length. A digipeater may be *specified* (you could be in range of multiple digipeaters), in which case its callsign must be included, making the address field 21 bytes in length.

Recognizing that future protocols may emerge, the packet group decided to append a Protocol IDentification byte (PID) to the control field of the frame to let the receiving station know which protocol was in use, and AX.25 was assigned an identifier.

The advantages of this system are numerous. No longer must an amateur worry if another station has the same ID when he receives a packet. Many users may be accommodated (from an addressing point of view) with no effective limit. Monitoring of a channel becomes simplified, with a monitoring station able to identify (by callsign) the source and intended destination of every packet receivable at his location.

Of course, nothing is free, and AX.25 has its costs. The main problem is that the address field is quite long, being 21 bytes if a digipeater is used. At TAPR, we wanted to play with multi-hop packeting, so we allowed up to eight digipeaters to be specified. This makes for an address field of up to 70 bytes! This is a lot of overhead merely to send a zero data-length ACK.

Another limitation of AX.25 is that it doesn't allow for the typical amateur practice of roundtable discussions. Since a station may connect only to *one* other station, some sort of monitor mode must be enabled to see activity from other packet stations. If the "monitored" FCS is corrupted, the packet is discarded. In the case of very weak signals, it is common to miss a lot of the monitored activity. Some provision must be made to accommodate this type of networking, and it will most likely take place at level three. This problem appears to be unique to amateur packet requirements at present, so we must pioneer and develop this capability.

The lack of multiple connectivity poses another problem. Suppose a station has a computer mailbox or bulletin-board service available on packet. Since only one connection can be maintained at a time, only one user can check in at a time. If others wish to check for messages, etc., they must wait until the first user disconnects. If he suffers a power outage or otherwise leaves the air without properly disconnecting, the mailbox station will lock up until reset. Thus, other users are denied access.

There undoubtedly will be further experimentation with link-level protocols, but AX.25 forms a sound basis and a common language for such development to build on.

A Typical Connection

To illustrate the functioning of packet protocol, an example of a typical connection sequence follows. (Note that in packet parlance a connection is merely establishing contact with the desired station.) Let's say that station WA7GXD wishes to connect to station NØADI. WA7GXD would type at his terminal: C NØADI.

A packet would be sent that could be represented as—: FLAG : NØADI : WA7GXD : SABM : FCS : FLAG:.

Note that the destination station callsign precedes the sending station callsign. The control field SABM means "Set Asynchronous Balanced Mode," which is data-communications talk for "connect me to the other guy and treat us as equals—no one is a control station."

Assuming NØADI is on frequency and his TNC is allowed to accept a connection request (he is not already connected with someone else), his station would respond with—: FLAG : WA7GXD : NØADI : UA : FCS : FLAG :.

In this case, the callsigns are reversed and the Unnumbered Acknowledgment (UA) is sent in the control field to ACK the connect request. At WA7GXD's terminal, the following message would be displayed: ***CONNECTED WITH NØADI, while NØADI's terminal would display: ***CONNECTED WITH WA7GXD. At this point the TNCs would enter the CONVERsation mode. Now any information entered at either station will be transmitted to the other station.

When the QSO ends, one station, say NØADI, will place his TNC in the Command Mode and enter: D WA7GXD, at which point his TNC would send out a packet like—: FLAG : WA7GXD : NØADI : DISC : FCS : FLAG :, where DISC is the control code to disconnect, and WA7GXD's TNC would respond—: FLAG : NØADI : WA7GXD : UA : FCS : FLAG :, and each terminal would then display: ***DISCONNECTED.

While in the connected mode, any information entered at one station's TNC will be sent to the other station and positive acknowledgment utilized to ensure that the receiving station in fact received the frame cor-

FOR FURTHER INFORMATION

The ARRL publishes the *Proceedings of the Second Amateur Computer Networking Conference* held in San Francisco in March, 1983. Copies are available from League Headquarters for $9.00 postpaid. Topics covered include the complete AX.25 specification, papers on the software and hardware aspects of the TAPR TNC, and other developments such as AMRAD's HF packet modem and Sweden's SOFTNET system.

Tucson Amateur Packet Radio's *TNC Manual* covers operation of a packet station in detail. Complete information is given on the TAPR TNC, including construction and checkout. Appendices include radio hookup and the complete AX.25 specification. This manual is available from TAPR for $20.00 postpaid in the US and Canada.

TAPR also publishes the bimonthly *Packet Status Register*, which is devoted exclusively to packet radio. Membership is currently $12.00 per year.

AMRAD, PO Drawer 6128, McClean VA 22106, publishes the monthly *AMRAD Newsletter*, which contains columns on packet radio. Annual dues are currently $15.00.

rectly. If the receiving station does not send the required ACK, the sender will repeat it. This goes on for up to *RETRY* times (RETRY being a user-entered parameter telling the TNC how many times to retry sending a packet before giving up and assuming the path no longer is usable between the stations).

The reasons that the sending station may not receive and decode an ACK are many. The receiving station may not have sent it due to (a) corrupted or garbled data bits, (b) someone else transmitting over the packet (a collison), (c) the receiving unit failed, (d) etc. The ACK may have been sent but not received correctly by the sending station for the same or other reasons.

In order to minimize the chances of a transmission getting stepped on or collided with, a station wishing to transmit will first listen and ensure that it doesn't hear any packet activity. Only then will it transmit. Further, if it is retrying a transmission, it will wait an additional *random* amount of time before transmitting. This helps ensure that two stations don't get "locked" and continually collide with each other.

If the retry count is exceeded, the station attempting to send will then report to the terminal:

***DISCONNECTED
RETRY COUNT EXCEEDED.

Thus, the operator is kept informed of any changes in the state of the communications channel, and valuable channel time isn't wasted in continually trying to maintain contact with a station that may not even be on the air.

From the above example it can be seen that the protocol issues involved in packet radio can be very complex, but that if properly approached, the result can be extremely reliable communications and efficient sharing of amateur frequencies.

Applications

No discussion of packet radio techniques is complete without some mention of the mulititude of practical applications of packet radio in the amateur environment.

Apart from FCC-mandated "advancement of the state of the radio art," packet provides unique opportunities for experimentation and public service.

Consider the aftermath of a tornado, earthquake, volcano, or other disaster. Usually, the first emergency traffic to be handled is done via amateur radio, especially if the damage is severe enough to knock out commercial lines of communication. In many cases, the traffic entered into the communications system far exceeds the ability of the system to handle it. The network becomes saturated and delays increase. It may take hours or even days to get all the messages handled.

Typically, voice or CW traffic nets are limited to a realistic rate on the order of tens of words per minute. Fatigued operators are subject to errors in copying and otherwise handling the information. As time wears on, the error rate increases.

RTTY or ASCII offers some improvement in system capacity, but errors are still likely.

On the other hand, packet offers the capability for operators to enter traffic without having to listen first (the TNC does that for them) and allows error-free communications to occur on a channel at nearly 1200 wpm (not quite 1200 due to ACK delays and the like). Multiple messages can be "in flight" at any given time, and the TNCs can sort it all out. Since the TNC likely is coupled into a computer system at some point, traffic can be passed to commercial lanes as they become available. Automatic logging of third-party traffic becomes trivial. And system capacity is on the order of 20 times that of RTTY. The capacity is even greater compared to CW or voice nets, especially when operator fatigue is considered.

As another example, consider the computer-minded amateur. Perhaps he has developed a program he wishes to share with another amateur. He can place his TNC in *transparent* mode, where it passes all data offered to it, and send a binary file dump to the other amateur, who passes it directly to his computer. Errors are trapped before the data is passed through, so the recipient can be sure that if he receives the program, it is right.

Another system used extensively on packet right now is the bulletin board, or computerized mailbox system. Amateurs may leave messages for other amateurs or get general information items, etc.

PACSAT is a proposed system much like a bulletin board except that it will be on board a future AMSAT spacecraft. Having as much as 2 megabytes of memory, PACSAT will fly in a Low Earth Orbit (LEO) similar to OSCAR 8 or UoSAT. The PACSAT concept is a pioneering one in the use of low-cost space technology since it is far cheaper to inject a satellite into an LEO (say, via a $10,000 Shuttle Get-Away Special) than to inject one into a geostationary slot (for a few million dollars). Further, there are many more LEO-launch opportunities than there are geosynchronous ones.

PACSAT will enable a low-power ground station with relatively unsophisticated antenna systems (a whip will do!) to leave and retrieve messages with PACSAT. Since we all don't live and work on the same schedule, PACSAT opens up a brand new opportunity for non-real-time "store-and-forward" communications.

For satellites such as AMSAT Phase III, which require a fairly complex ground station, packet offers the opportunity for several stations to share a common satellite link. By means of gateway operation, where one packet station has the needed equipment to track and communicate through the satellite, other packet stations can use the facility by operating through the gateway much like using a digipeater to increase a station's effective range. Similarly, HF and high-speed UHF/mi-

crowave links may be established with a gateway concept to allow other packet stations to utilize the resource.

Resource sharing in itself is an exciting application of packet radio. Perhaps a club is heavily involved in computing and wishes to purchase a high-capacity data-storage medium, such as a 100-megabyte Winchester drive. If the unit is networked into a packet channel, the various users may access it at will.

Of course, some of these activities, such as resource sharing, will require higher levels of protocol to be defined and developed, but the potential is there and they undoubtedly will get implemented.

Wrap-Up

This series of articles has introduced you to packet radio as it presently exists, with a short look into the anticipated future. An overview was given in Part I, where certain fundamentals were presented and a packet station analyzed.

Part II went into some detail covering packet hardware, with the specific example of the TAPR TNC given. Sufficient information was presented to enable the ambitious constructor to build a TNC for packet operation (and kits are now available).

This last installment has given an overview of packet protocols and applications. While not exhaustive in any sense of the word, some history and examples have shown the types of issues involved and the present level of packet communications capability.

For further details on amateur packet radio, I encourage you to write to Tucson Amateur Packet Radio, PO Box 22888, Tucson AZ 85734-2888. ■

L. B. Cebik W4RNL
5105 Holston Hills Road
Knoxville TN 37916

The CW Stationmaster

Regeneration turns the worst signal into a CW symphony. And that's not all you get when you build this station accessory.

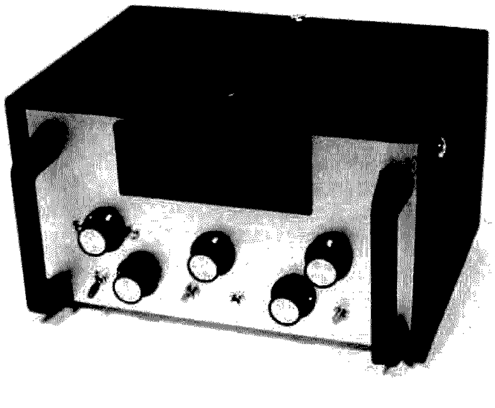
Every CW operator has (at least) two desires: to improve his ability to copy code through QRM and to be able to gauge accurately how fast he or the other fellow is sending. CRASH is a device which will enhance both abilities and provide a few extra options for the CW fan.

CRASH—Code Regenerator And Speedometer Hybrid—uses modern phase-locked-loop circuitry to provide good CW regeneration for clear copy. In addition, it counts the code speed of both transmitted and received signals. As a bonus, the unit serves as a code-practice oscillator that permits the instructor to adjust his speed accurately.

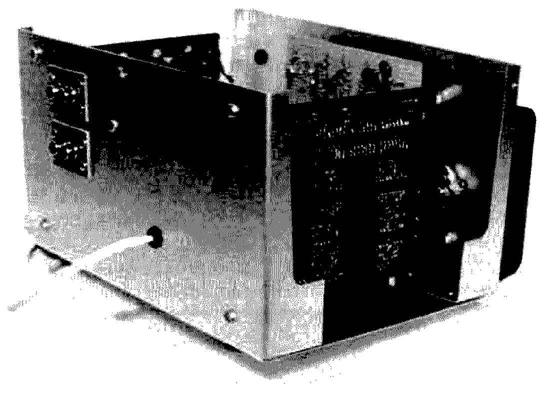
The hybrid part of the name CRASH derives from the sources of the ideas that went into its development. WB4TYL developed a very straightforward CW speedometer, "The Confidence Builder" (*73*, September, 1980, p. 134). One of the drawbacks of the unit was that it did not work well with received signals, since it responded to all signals in the receiver passband. The cure for this problem emerged from W3BYM's "Golden Articulator, a CW Regenerator for Amateur Receivers" (*Ham Radio*, October, 1980, p. 64). The heart of this unit is an LM567 phase-locked-loop tone decoder with a very narrow passband. Combining the two circuits became an easy task, since both made extensive use of LM555 timers, very handy devices indeed. The remaining chips are standard TTL ICs, plus an optocoupler and an LM386 audio amplifier.

By combining the two circuits, with additions and modifications, we achieve the following results:

- a CW regenerator with a narrow, variable frequency passband for single-signal reception;



Front view of completed CRASH unit.



Internal view.

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- automatic or manual return from the regenerator function to receiver audio;
- a CW speed counter which updates every five seconds;
- provision to count either transmitted or received code speed;
- a code-practice oscillator suitable for training Novices through Extra-class hams by precisely setting the practice speed;
- optically isolated keying of the unit in the CPO function;
- digital output for audio input, hence the possibility of keying other devices, such as a computer or TV readout;
- relatively simple circuitry through extensive use of 555 timers;
- a design amenable to one-stage-at-a-time building and adjustment.

Even if you do not want to copy CRASH as a total unit, there may be some useful ideas in it for other projects around the shack.

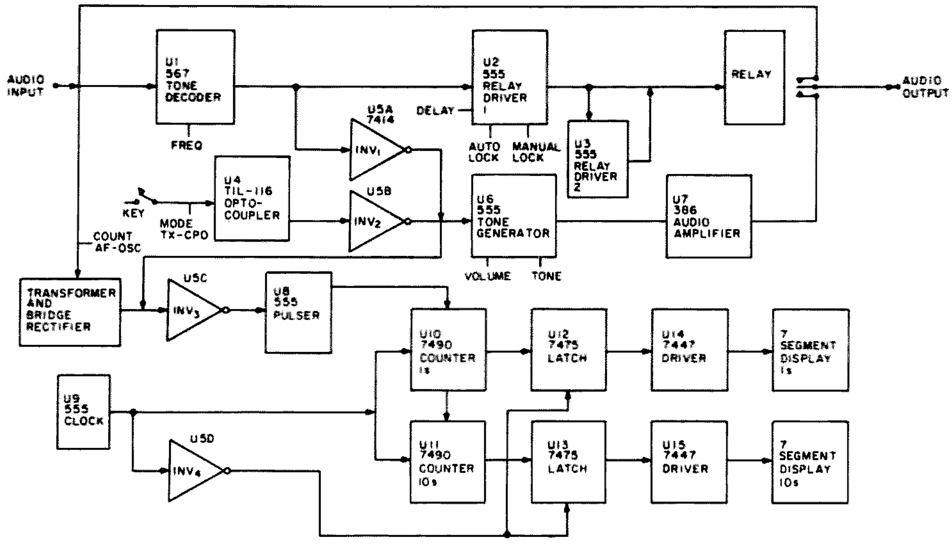

Fig. 1. Block diagram of CRASH.

Functional Analysis

Although the circuit diagrams (Figs. 2 and 3) appear complex, the functions break down in a very direct manner. Fig. 1 provides a block diagram of the entire unit to make clear what happens to CW entering at the audio input jack. Since there are so many 555s, each has been given a functional name for easy identification.

When receiving CW, the 567 tone decoder is the first step in the signal processing. It has a very narrow bandwidth, even with high inputs: 14% of the audio frequency. Over the range of the decoder (400 to 2000 Hz) this amounts to 56 to 280 Hz, a figure excellent for CW, but also capable of producing ringing in most filter designs. Since we throw away the audio at this point and create our own in a later stage, ringing is no problem.

From the decoder, which produces a digital low when a signal is present, we move in three directions. One is to a tone generator (555) which produces new CW in the astable mode. Adding the LM386 amplifier lets us change the square-wave output into something a bit less harmonic-laden, but still not a pure, monotonous sine wave.

The second direction is to a pair of 555 relay drivers. The first has variable delay time and is activated by the presence of CW plus a short press of the spring-loaded toggle switch. There is also a manual switch to change from receiver audio to regenerated CW. The second relay driver has a fixed 2-second period and is activated by the first when its cycle ends. This permits time for continuing CW to reactivate the first driver, thus holding the relay in for the entire transmission.

The third direction from the decoder is to the 555 pulser which triggers the counter. For each leading edge of a dot or dash, the pulser sends a very short (10-ms) pulse which the counter section counts during a 4.7-second period. The readout provides a display of the code speed.

The counter section itself is very standard and might be considered obsolete in the face of new combined devices available for counting and readout work. A 555 clock provides adjustable 4.7-second highs to enable counting and a brief .1-second low for resetting and latching. The 7490s build the count during the high, and their last count is latched in the 7475s by the low while the 7490s reset. The latched count is converted to 7-segment display format by the 7447s and read out on the common anode displays. The counting section runs continuously in all modes of operation of CRASH, and thus can tell us the received speed, the transmitted speed, or the CPO speed.

Back at the main board, there is a provision for switching in speaker audio to the pulser through a step-up transformer and a bridge rectifier and filter. One section of a 7414 Schmitt trigger inverter provides a sharp square signal to cue the 555 pulser. This section is most useful in checking transmitted speed by using the sidetone. Since the sidetone will rarely be in the passband of the decoder, it will not register unless we retune (a bad idea) or unless we use a wideband circuit (a better idea).

The tone generator and pulser also can be triggered directly so that we can use the CRASH unit as a code-practice oscillator. Since all my equipment is set up for negative-voltage keying, an optoisolator/coupler (TIL-116) with a negative supply permits me to switch to the CPO mode and key a compatible voltage. The inverter provides the necessary high for the tone generator and pulser. In fact, the inverters shown but not mentioned are also placed in the circuit just to make sure that each device receives a controlling signal of the proper high or low state, as needed.

For the entire unit, a relatively simple power supply suffices. The five-volt supply needs to be very well filtered (since we are working with audio and not just digital signals) and well regulated (for TTL chips). In fact, the combined digital-audio techniques represent a second reason for calling CRASH a hybrid circuit. The negative supply is uncritical; with component adjustment, anything from −15 to −50 volts will work.

Circuit Details

Having run through the entire unit, let us look at some of the circuit details that bear mentioning, either because we might want to

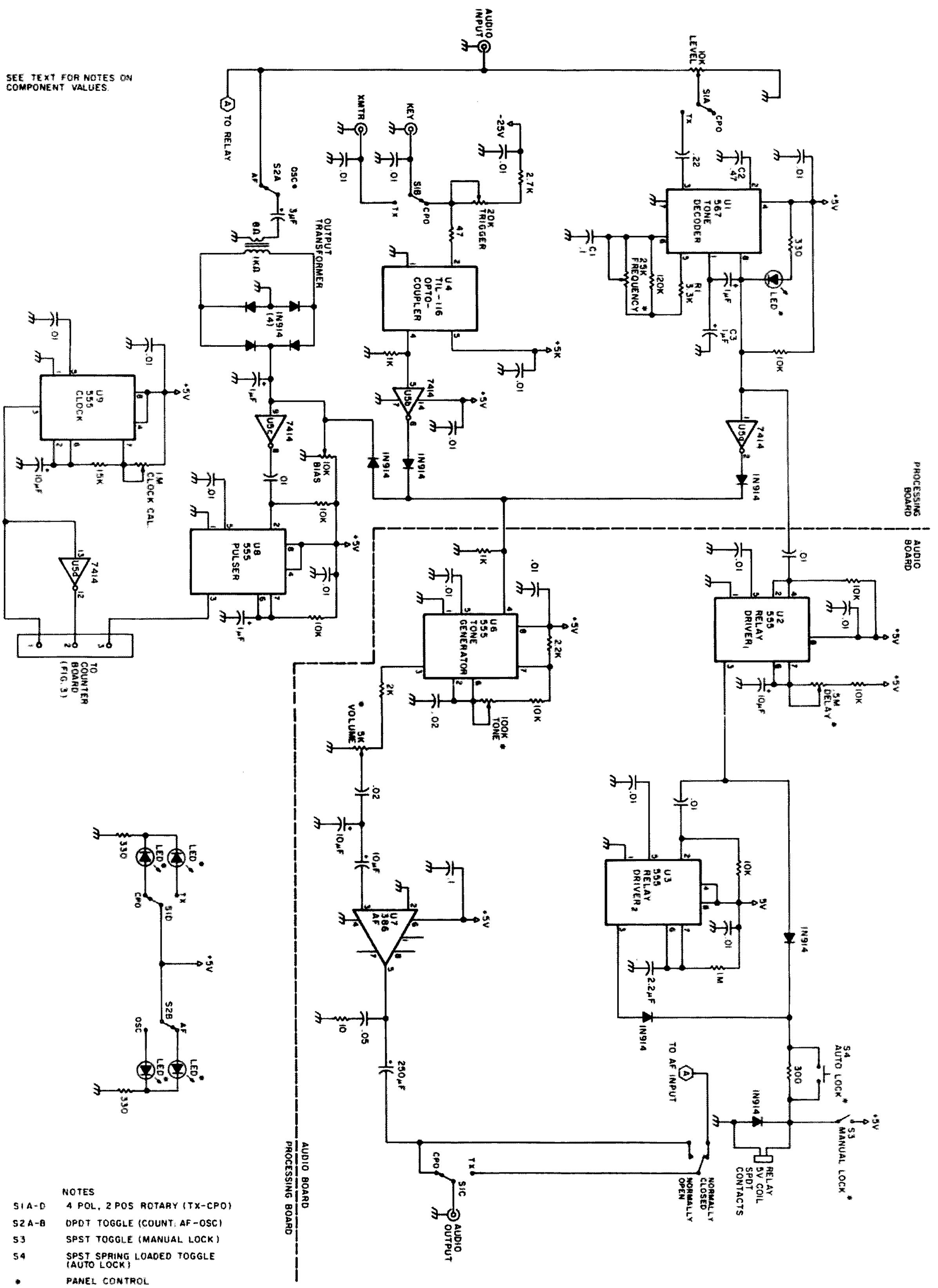

Fig. 2. Processing and audio sections of CRASH.

experiment with them or because some caution may be in order. Fig. 2 will aid us here.

The 567 tone decoder chip is extremely versatile, and a data book will provide you with enough information to experiment with values. The frequency range of the unit with the resistor and capacitor values shown at pins 5 and 6 runs from a little over 400 Hz to just above 3000 Hz. The last thousand Hz are extremely compressed, and 2000 Hz is the useful upper limit for tuning in signals. If you prefer a different range, the frequency is determined by the formula $F_O = 1.1/R1C1$, where R1 is the series-parallel combination of the 25k pot, the 120k resistor, and the 3.3k resistor, and C1 is .1 uF. The minimum resistance should be no less than 2k.

With most received signals, the input signal level will run above the 200-mV level at which the decoder limits and the bandwidth levels at 14%. For maximum speed of the decoder, that is, the fastest rate of cycling in response to received code, C2, the bandwidth filter should be derived from the formula C2 = 130 uF/F1, where F1 represents the lowest frequency to be used. This gives a value of .325 uF, and hence the .47-uF capacitor shown. C3, the output filter, should be about twice the value of C2 as a minimum, hence the 1-uF unit. The 1-uF feedback capacitor between pins 8 and 1 provides suppression of chatter, that is, multiple on-off cycling at the leading and training edges of the dots and dashes (a phenomenon which does not disturb the tone generator, but which produces some unbelievable code-speed indications). Since the highest cycling rate for the unit is given by the decoder frequency divided by 20, and since for practical purposes the highest code speed is about twice this value (in terms of

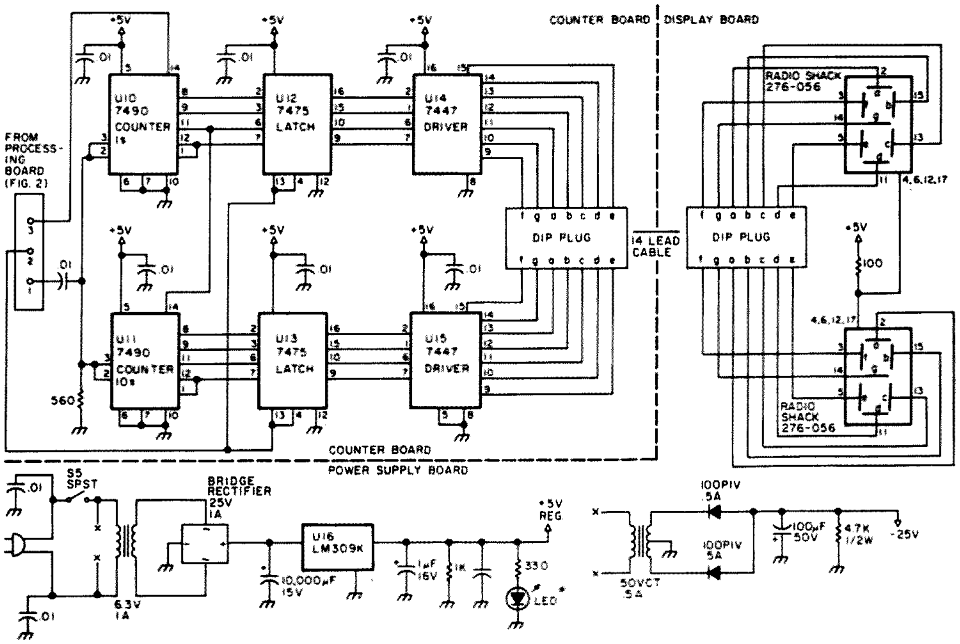

Fig. 3. Counter, display, and power supply sections of CRASH.

dots and dashes, not in terms of bauds), the values shown may be a bit low for those who listen to lower-speed code in the main. Static, which is random in tone and hence sometimes is in the passband of the decoder, may activate both the tone generator and the counter. Experimenting with values for C2 (and adjusting C3 accordingly) can overcome this at some loss of tracking at the very highest speeds. The feedback capacitor should also be enlarged in such cases.

A single 7414 chip provides all the inverters needed for the entire unit—with two left over. The 7414 inverters are Schmitt triggers which provide extremely sharp rise and fall slopes. About the only place they are essential is just preceding the pulser to sharpen the rectified audio into a good digital pulse to key the pulser cleanly. The two inverters feeding pin 4 of the tone generator could have been combined into a NAND gate (¼ of a 7400) as shown in Fig. 4, with the remaining sections used as inverters by tying together their inputs. This would have saved the use of diodes and

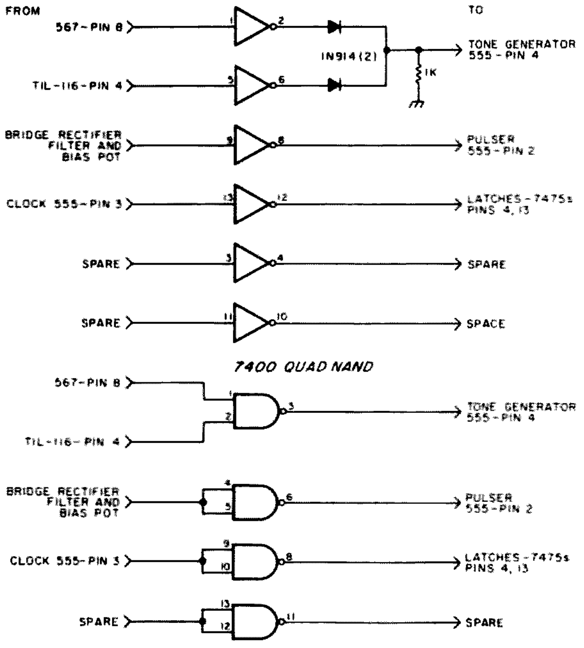

Fig. 4. Using a 7400 in place of the 7414.

the 1k ground-return resistor. Either system should work well.

All of the 555s are used in standard ways as either monostable timers or as astable oscillators. Among the monostables are the relay drivers. The first has a variable time period of .1 to 5 seconds, which is controlled from the front panel. The second is fixed at 2 seconds. This system is more reliable than the original, which used a large capacitor across the coil of the relay. The value of the requisite capacitor will vary according to the coil characteristics; the present system makes the delay in opening the speaker to receiver audio independent of the re-

lay. The 300-Ohm resistor between the output diodes from the 555s and the relay may require some adjustment depending on the relay you have in hand. The Auto switch is a spring loaded toggle which shorts out the resistors and keys the relay when a signal has activated the first driver. Since the voltage needed to pull in a relay is greater than that needed to hold it in, the relay remains in the circuit as long as either one of the drivers is activated. The 555 is triggered faster than its output falls, so there is no noticeable voltage drop during the transition from the first to the second driver. The Manual switch allows you to hold in the relay independently of the Auto circuit.

The other monostable 555 is the pulser whose 10-millisecond pulses permit tracking of CW to a very high speed.

The tone generator is a standard audio range astable circuit for the 555. Volume and tone controls are provided on the front panel. With the values shown, tones from 200 Hz to 3000 Hz are available. Contrast this circuit, where the wave has nearly equal positive and negative halves (or nearly equal on and off times), with the clock 555, which places the large resistor value between Vcc and pin 7. Here the "on" time is very long and the "off" time very short. The 4.7-second on time can be adjusted using a digital stopwatch (averaging several tries) or by allowing the counter to show the speed of a known transmission, such as a timed code-practice session. The 1-meg pot shown should be a miniature trimmer with 10 to 15 turns; otherwise, the adjustment will be very tricky. The .01 capacitor from the clock to the 7490s provides a count-clearing pulse that drops again through the resistor to permit gathering a new count.

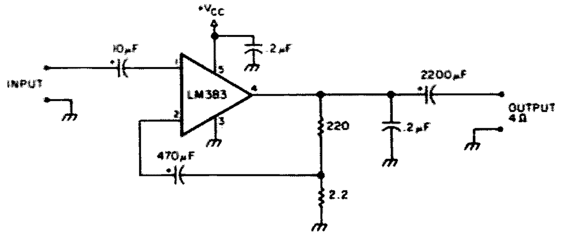

Fig. 5. An alternative audio amplifier.

The inverter provides the positive pulse to the latches to clear their old count and take on a new one for display. At the 7-segment readout, the single 100-Ohm resistor provides a simple means of lighting the units; however, brightness will vary depending on how many segments are lit simultaneously. For constant brilliance, use a 300-Ohm resistor in each lettered leg and omit the 100-Ohm unit in the supply line. Note that the lead zero is suppressed. The schematic shows the units in reverse order of visual indication—be sure to get the tens unit on the left. For common cathode displays, use 7448s instead of the 7447s and reverse the supply voltage.

Supplementing the basic circuit are a number of features. The optoisolator/coupler permits use of the unit as a code-practice oscillator. The internal LED of the TIL-116 (or just about any other available similar unit) is fed negative voltage through a multi-turn pot trigger-level adjustment. Use the minimum current that will key the output transistor cleanly, since there is little load on the circuit. The 47-Ohm resistor between the pot and the TIL-116 is a safety feature limiting the maximum current the LED can draw.

The LM386 is an extremely easy chip to use as an amplifier. It provides about a quarter Watt of power at 5 volts, far more than enough for a single CW tone. The 1-uF capacitors at the input make triangles out of the 555 square waves. Under load, these bend into hybrid sine and square waves, which are very pleasant to listen to for long periods of CW. The series resistor and capacitor to ground in the output might be omitted at the risk of what National Semiconductor calls "bottom side fuzzies," a distortion to the negative peak of the waveform. I was able to produce this effect easily, so I recommend retaining this simple insurance of good reproduction. If you desire more power, Fig. 5 shows an alternative amplifier using the LM383. This one will fill an auditorium with sound if your speaker is big and good enough.

The transformer and bridge circuit are miniature parts, the transformer being a reversed transistor output unit for driving speakers. The diodes (like all others, except in the power supply) are 1N914 equivalents. One uF should work as the filter, but you might wish to verify first that the inverter swings cleanly and that the counter gives accurate readouts. The bias pot, another multiturn unit, should be set for about .8 volts. More precisely, adjust it for a level that permits audio signals of moderate level to cleanly swing the inverter.

Switching within the unit may look complex, but actually is straightforward. The TX-CPO 4-pole, 2-position rotary changes several things at once. The speaker audio reaches the decoder in the TX position. In the CPO mode, the amplifier (LM386) output is switched to the speaker rather than allowing the relay to control it as in the TX mode. The key is switched from the TIL-116 circuit (CPO) to the transmitter (TX). Finally, a pair of LEDs are switched to indicate the mode. Other switches are the two relay driver control switches, a DPDT toggle to place the audio input into the bridge and counter circuit (with LEDs to indicate what is being counted), and the power switch. One other LED appears in the decoder circuit to give a visual indication of tone-decoder signal lock and the code being received.

The power supply is normal in every respect, with an LM309K regulator in the +5-volt line. Note the heavy filtering in this supply to suppress hum. Those who work with digital circuits are accustomed to using about 3000 uF in such circuits, but audio requirements are much more stringent. The negative supply is unregulated and uses a small transformer from the junk box. Since its only function is to provide voltage and current to the optoisolater/coupler, not much of either is needed and any small transformer from 15 volts up will work. Although the LED in the TIL-116 requires only about 1.7 volts, the higher initial voltage provides room for adjustment of LED current to the lowest level that will key well.

Construction

Duplication of CRASH exactly as shown is a fairly straightforward task, but it may not be the best way for you to go. Many of the circuits can be replaced with others you prefer, and as long as each works at TTL levels, substitution should present few problems. Many extra features can be built into the unit to serve your CW needs, so before building, try modifying the design to fit your desires. After all, this is how CRASH happened in the first place—by a combination and adaption of ideas used by WB4TYL and K3BYM. The odds are

.-.-/... .-. -.-- .... .

you can come up with some new design wrinkles and improvements.

Construction of the CRASH unit is a matter of taste. All will fit in a Radio Shack 9" by 5" by 6" cabinet, as the photo shows. Fig. 6 shows a sketch of a layout for inside the cabinet, while Fig. 7 suggests some board layouts by reference to the ICs. Although the prototype was built around two boards—one for processing, the other for the counter—I recommend using three. The processing board is overcrowded after circuit modification and adjustment.

Radio Shack digital experimenter boards (#276-156) for use with edge connectors (#276-1551) make convenient bases for the components, and Fig. 7 is drawn with these boards in mind. The counter board contains the 7490s, the 7475s, and the 7447s lined up in rows as in the schematic. The ouputs to the display board use a 14-line DIP connector set. A slightly larger set would permit running the power and ground connections as well.

The processing board should contain the 567 decoder, the 7414 inverter chip, the 555 pulser, the 555 clock, the transformer and bridge circuit, and the TIL-116 optoisolators. A separate audio board should contain the 555 tone generator, the 386 amplifier, and the two 555 relay drivers, along with the relay. The three boards might be mounted vertically in the case. The power supply is built on perfboard and mounted on standoffs at the bottom of the case for good weight balance. The display board also uses perf material and is held to the front panel by standoffs attached to the lugs on the bezel for the readout. Since most bezels are large enough for up to six digits and we only need two for this project, indicator LEDs (six of them) are mounted on the display board against a black foam background. This minimizes panel work and makes an effective blackout display when power is off.

Since the photo of the front of the unit was taken before the addition of the lettering, the panel control knobs are as follows, from left to right: decoder frequency, relay delay, TX-CPO switch, regenerator tone, and regenerator volume. The toggle switches along the bottom of the panel are, also left to right, ac power, auto relay, manual relay, and audio-oscillator counting. Were I to build a second version of this unit, about the only change I would make is to add a 2:1 or 3:1 vernier to the decoder frequency control, since tuning is just a bit tight at higher audio frequencies.

Because the unit mixes digital and audio functions, it is easy to slip into digital habits and ignore the fact that ground loops and hum pickup are potential problems in layout. Besides using a high level of filtering in the +5-volt supply, some extra precautions will minimize problems. Use short ground leads and attempt to ground all parts of each circuit to a common pad or small area. Group the main audio circuits together especially the 555 tone generator and the 386 audio amplifier. Use shielded leads from input and output terminals to the boards, and between boards, for all audio lines. On each board, run a 47-uF or 100-uF electrolytic to ground at the power entry point and bypass each chip with at least a .01-uF disc ceramic capacitor.

Since you will be using the unit in the presence of your transmitter and with the keyline running into the unit, good rf practice is also essential. Bypass both ac lines where they enter the case with .01-uF disc ceramic (1000-volt units, which are getting harder to find at discount prices). Also bypass the key jack and the transmitter jack with .01 units. Since rf can instantly disable many ICs, especially at transmitter leakage power levels, the more bypassing, the better. It should not affect dc levels in the keying circuits. When you develop your own layout, be generous in this department. If in doubt, bypass it. Finally, be sure the case is at dc ground potential. Some of the anodized cases make it difficult to get a good ground contact, so be sure to use a good tooth washer at contact points.

Since this is a one-of-a-kind unit, I regret that no circuit boards are available. However, The Radio Shack epoxy experimenter boards are fun to use, and where perfboard is recommended, the wiring is easy and straightforward. The toughest problem will be to have patience during construction.

When you build the unit (if you do build one), I recommend one of two procedures. Either build the unit a stage at a time, or at least omit the power lead to every chip until it is time to check out the circuit. The first step, as in all projects, is to build and test power supplies. Once these are ready, we can work progressively through the rest of the stages.

A good place to start is with the counter board, which can be built complete, along with the seven segments of the display board. Since there are few components besides jumpers between ICs, visual inspection should prepare you for testing under power. Next, verify the clock 555 as operating by checking its output (and the output from its inverter section) with a VTVM. If all is well, connect to the counter board. Only the right (ones) digit should light and show zero (although there may be a spurious count when power is applied). For test purposes, you can key 5 volts through a resistor (say 1k) to the counter input to verify counting. If all is well, time the counter with a stopwatch. An easy way to check periods is to tap the key a few times so that the count changes at the end of the period. The

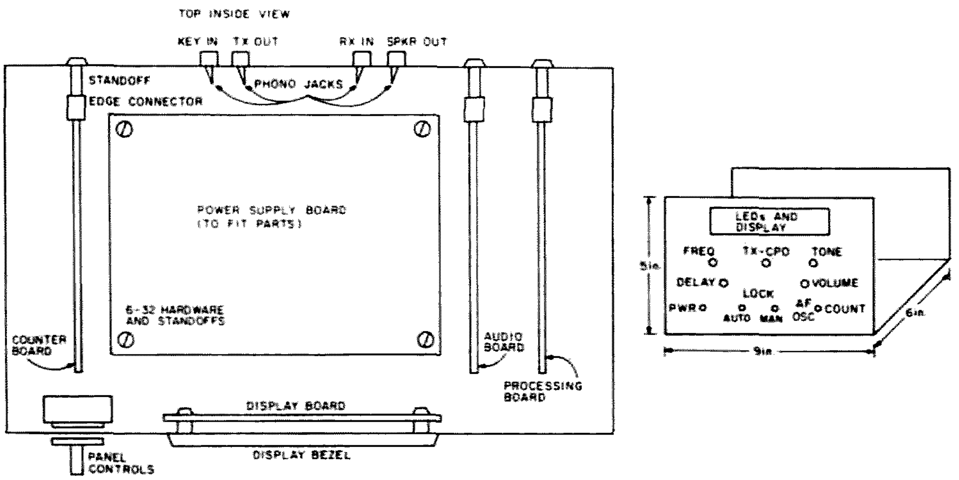

Fig. 6. General layout sketch for CRASH.

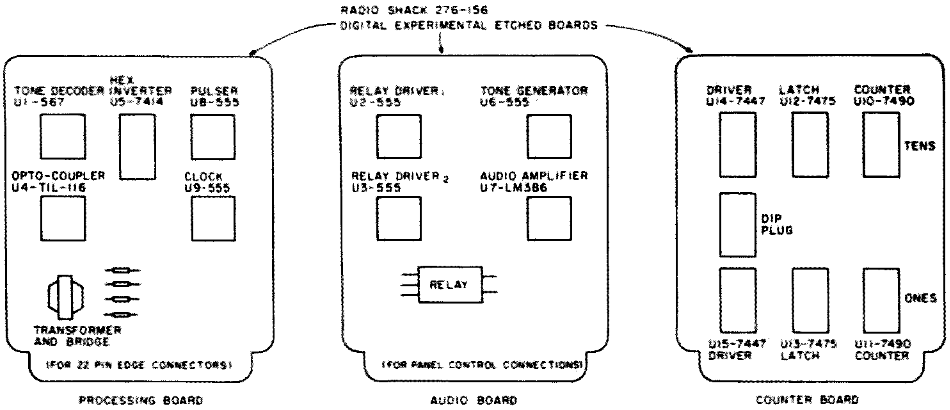

Fig. 7. Suggested board layouts for CRASH.

target for reasonably accurate code-speed readouts is 4.8 seconds per total cycle.

The next step is to verify the 555 tone generator. In the absence of the tone decoder and TIL-116 keyer, key the tone generator by applying +5 volts to pin 4. When you are satisfied with its volume and tone ranges, add the 386 amplifier. If you have a scope, you can check the waveform and adjust the capacitor network between the 555 and the 386 to suit your taste. The 555 can overdrive the 386, so check the output with a scope if you can. Adjust the coupling capacitor (shown as .02 uF in the schematic) so that the waveform just begins to flatten at full volume.

At this point, you can move in several directions according to your preference. Now is a good time to wire the TX-CPO switch and adjust the TIL-116 optoisolator/coupler. Begin with maximum resistance on the 20k multi-turn pot and reduce the resistance until pin 4 of the TIL-116 shows clean keying without hanging, as indicated by a VTVM. The object here is to get clean keying of the tone generator with minimum current to the LED. Since the inverter requires little current from the phototransistor output of the TIL-116, there is little need to overdrive the system.

We can now count our own code speed as we key the optocoupler, since the inverter which keys the pulser is driven. Adjust the bias 10k multi-turn pot until the output of the inverter (pin 9) also shows clean keying without hanging, as indicated on a VTVM. About .8 volts of bias will suffice, and we will readjust this control in a moment. For now, we should see our code-speed readout on the seven-segment displays every 4.8 seconds. To be sure that counting is good, key the unit a known number of times (that is, 2 to 12 or so dots) within a counting period and wait for the readout to correspond. In this way, we can check that the counter and pulser are giving us proper performance.

At this point, wire the AF-OSC switch and the input to the transformer. The OSC position is blank, since the incoming count connection is made directly to the pulser's inverter. Audio from the speaker, however, goes directly to the transformer through the switch to count the sidetone oscillator during transmit periods or to count received signals when the band is clear. An audio generator with a few volts output at low impedance will aid you to readjust the bias 10k pot so that the keying is clean. Weak signals may not push the voltage to the inverter high enough to trigger the inverter, but once connected to the receiver, the sidetone should key the counter easily. You may want to tweak this adjustment later when the unit is connected to the station rig.

We have saved the tone decoder 567 for last. Using the audio generator so that the 567 has about .2 volts at its input and with the TX-CPO switch in the TX position, locate and lock the audio signal with the frequency control. 700 to 900 Hz should put the control about midrange using the series-parallel resistor combination given. If you key the audio line, the tone generator should follow without delay and the count should be accurate. If the count goes very high, even at slow keying, you probably are experiencing chatter and may want to increase the feedback capacitor between pins 8 and 1 from the 1-uF value shown. The LED from Vcc to pin 8 should also track the keying.

Assuming that all is well to this point, check the unit with on-the-air signals on a fairly clear band. If the 567 responds too readily to noise (anything from QRN to internal receiver pops), you may want to increase the values of the capacitors at pins 2 and 1 of the 567, remembering to keep the larger about twice the value of the smaller. This will slow down the response of 567. We cannot eliminate all response to noise without cutting off higher speed CW, but we can find values that will keep the counts fairly accurate and eliminate hash from the keying of the tone generator.

At this point, the CRASH unit should be operational and ready for dial decals, case covering, and regular use in the shack.

Operation and Modification of CRASH

Operating CRASH is simple but requires some adjustment of your habits. When receiving CW, find the desired signal with the frequency control. The LED will track the code when the signal is in the passband of the 567. If the signal drifts, it is probably better to ignore the regenerator and concentrate on the station. Stable signals, however, will stay in the passband. Once the signal is acquired, use either the auto or the manual toggles to switch to the regenerator.

Since CW without QRM and QRN sounds strange at first, you may initially dislike the effect. Part of learning to like clear reception is choosing tone and volume settings that please your ears. You may find that you prefer a lower volume than with received signals, and the tone you choose may be something different from where you usually tune signals in the receiver passband. Experimenting with signals on relatively clear bands is the best way to match the unit to your preferences.

Although the 567 tone decoder accepts a wide range of input levels, receiver characteristics limit the useful range. Weak signals beyond the receiver agc limit can fade below the 567's ability to lock, and excessive volume may be accompanied by enough noise pulses to hold in the relay continuously, even without a signal. The level control can be adjusted to provide the 567 with input voltages tailored to your own habits with the receiver volume control. However, you may have to adjust receiver volume to suit the 567 if you of-

ten move from noisy bands with high signal levels, like 80 meters, to quiet bands with weak signals, such as 15 meters in the evening. Considerable experience using the CRASH unit may be needed before you settle on the final compromise setting of the level pot.

Although the unit operates well as is, CRASH is a good project for trying out new ideas. For example, Fig. 8 shows the insertion of an amplifier to isolate the audio to the speaker from the inputs of the transformer and the 567. Any amplifier which limits the voltage at the output in a controllable way should work here. Fig. 8 also shows an extra transistor in the relay circuit, in case you wish to drive relays of other than 5 volts, or in case you want to drive a heavier load.

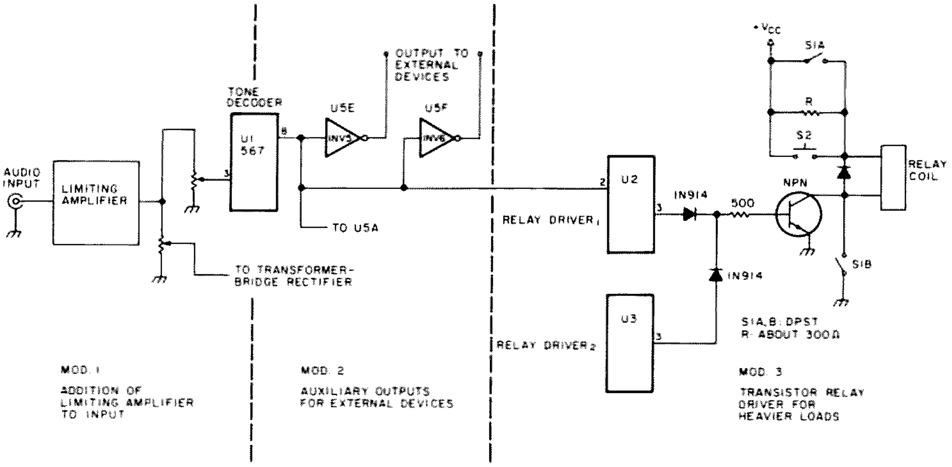

Fig. 8. Some modifications to CRASH.

In addition to these options, which have been tried but are not used in this version, the CRASH unit provides possibilities for external connections. Since the 567 bandwidth is narrow and its output is digital, the unit can also be used to key other devices. Fig. 8 shows inverters as buffers to other devices, such as a MORSE-ASCII converter system for television or a computer readout of the CW. How you do this is open to many options, and a system is under development here for driving a TRS-80 III. Once you have brought the unit this far, then computer keying, automatic logging, and other station conveniences are only a dream and a soldering iron away.

In short, the CRASH unit not only works well as a CW regenerator and code speedometer, but it also forms the basis for a number of other station options. But that is the way it usually goes with ham projects: One thing leads to another and nothing is ever finished for good. There is no telling what a good CRASH will lead to next. ■

Top Drawer, Micro-Style

Building circuits is fun, but drawing them isn't. Let your Apple do your drafting.

Bill Smith K3LF
RD 2, Cold Spring Creamery Rd.
Doylestown PA 18901

Using a microcomputer to assist in designing circuits is a natural. I recognized this shortly after acquiring my Apple computer and proceeded to build a library of electronic-design programs. My library covers such things as audio filters, timers, multivibrators, and many op-amp circuits. Most of the programs were entered from magazine articles such as those found in back issues of *73*. These programs are a real asset when designing or trying to "ballpark" component sizes for a particular application.

As helpful as these programs are, they have one major weakness: They have no way of displaying the circuit diagram. To make matters worse, they usually refer to components as "R1" or "C3." To find out where "C3" is located in the circuit, you have to find the article from which you entered the program and hope that the author included a circuit diagram with all of the components labeled correctly. If you are like me, you will probably find that you lent that particular magazine to a friend who just left town for a sabbatical in South America!

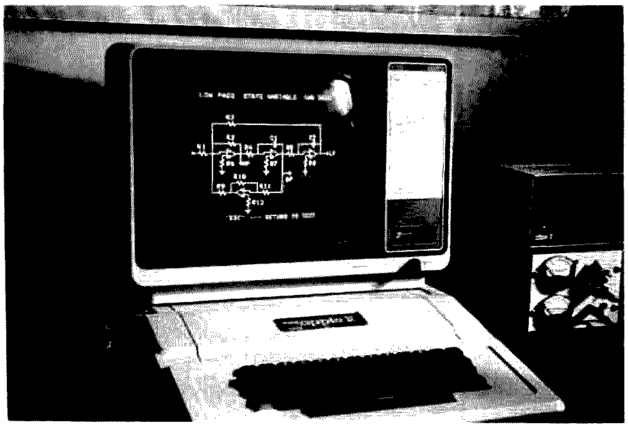

Fig. 1. Schematic of an active audio filter as it would appear within a program. This is typical of the type of schematic which may be incorporated in your programs.

Well, hang on, help is on the way. This article describes how you can incorporate that schematic diagram within your program so that it will be available at the touch of a button.

I have devised a system that uses the excellent HIRES capability of the Apple II to your best advantage. I decided that the system to be used should be fairly easy to implement; I did not want to spend hours entering a diagram for each program. I needed a system that would be flexible so that I could enter all types of electrical schematics, not just one unique circuit. Lastly, the system had to allow me to enter fairly complex circuits.

With all of these points in mind, I embarked on a six-month project to develop the system described here. I call it my "EGG" (Electronic Graphics Generator), and it really works.

The EGG is nothing more than a shapefile with up to 200 shapes and a system to map the shapes onto the HIRES screens. (Currently there are 135 shapes in the shapefile but I have set up the file to handle up to 200 for any future expansion.) The first 59 shapes are characters generated by the Apple's text generator. These shapes are used for labeling circuits and components and for any text desired on the HIRES screen with the circuit diagram. Shapes 60 through 65 are Greek letters common to electrical diagrams (such as lambda for wavelength), 66 through 99 are the actual electrical components, and the remaining shapes are used for connecting the components and drawing rectangles representing ICs.

The Apple HIRES screen dimensions are 280 points horizontal by 192 points vertical. I used these dimensions to determine the optimum size for each shape in my shapefile. Each shape is drawn within a grid that is 15 ×15 with the origin of the shape located at the center of this grid. Using these dimensions, I could accommodate 18 shapes horizontally and 12 shapes vertically for a total of 216 shapes

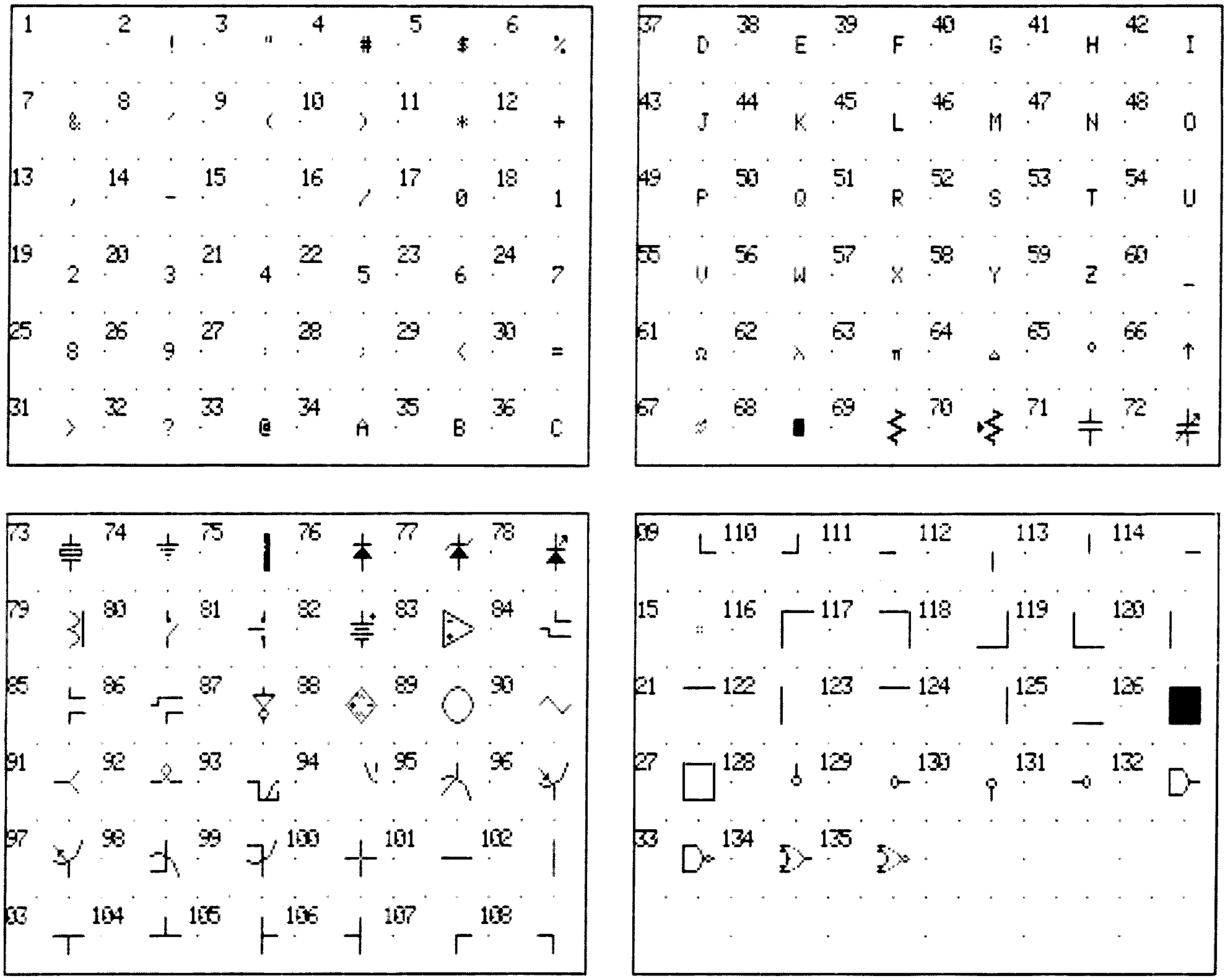

Table 1. These are the shapes in the shapefile along with their respective shapenumbers. You may add an additional sixty-five shapes to the file if you can think of any to add.

on each screen. With two HIRES screens available, I could have up to 432 components in my circuit, more than enough.

Practically speaking, the number of components you will be able to fit on the screen will be much less as labels and connecting lines take up some space. To date, the largest diagram I have used contained 28 components and it easily fit onto one screen. With a little effort you should be able to get as many as 50 components on a screen and still have them labeled properly. Fig. 1 is an active audio filter which I recently used in a program. As you can see, this is a moderately complex circuit but it fits on the screen well and all of the components are easily recognizable.

As mentioned, the shapes are all centered in a square measuring 15 spaces times 15 spaces. This is an important point and I want to explain it in more detail. If you examine shape 76, a standard diode, you will notice that the leads are centered on the 15×15 grid. I have enlarged this in Fig. 2 so it may be seen more readily. You will find that all of the components have their leads exiting on a center line, either horizontal or vertical. If I draw two of shape 76 and each is rotated 90 degrees, with one centered 15 spaces above the other, the leads will appear to connect as shown in Fig. 2. Having the origin of all of the shapes located in the center allows us to use the ROT (rotate) command so that we can draw the diode as

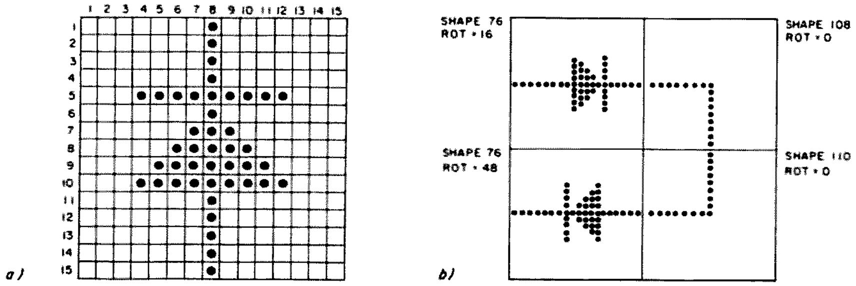

Fig. 2.(a) Shape #76 as it would appear under a magnifying glass. (b) This drawing shows how the shapes are rotated and combined to form schematics.

shown, and you will find that the leads exit the grid centered on either side. By maintaining this convention throughout the shapefile, I have made it possible to draw any of the components in any of four orientations with their leads available for easy connection to the next component.

By now you should have a good idea of how the shapefile is set up. Next, I will describe how to use it to get diagrams into your programs. There are two methods. One is quick from a programming point of view but takes longer to execute and uses more room on your diskettes. The other takes a little longer to program but executes quickly and takes little storage room.

The first method is to use the schematic draw-and-edit program accompanying this article. This program makes it very easy to draw, label, and edit a diagram. Once the diagram is drawn, the entire map of the HIRES screen is saved to disk. This method is quick. (The schematic in Fig. 1 took about ten minutes to draw and edit using the EGG program.) The main drawback to this method is that each screen must be loaded from disk when needed. It takes about 34 sectors to store this much information, and it takes about 8 seconds to read it in from disk. This 8-second delay in the middle of a program is mildly disconcerting but certainly acceptable.

The second method is to enter into your program the necessary BASIC language statements to draw the shapes during program execution. Using this second method to generate the diagram of Fig. 1 took less than one second during program execution but requires about thirty minutes of programming.

Using the EGG program is really quite easy as it is menu-driven and contains many useful edit commands. There are two levels of menus. The first level is used to select which HIRES screen you are interested in using and the second level allows selection of various

Program listing 1. This is the actual shapetable. This should be entered exactly as shown beginning at address hex 8000.

```
8000- 83 00 92 01 94 01 98 01
8008- A3 01 B5 01 C5 01 D2 01
8010- E3 01 E8 01 F5 01 FF 01
8018- 0A 02 12 02 16 02 1B 02
8020- 1E 02 27 02 36 02 3E 02
8028- 4B 02 5B 02 63 02 73 02
8030- 82 02 8E 02 9D 02 A6 02
8038- A9 02 AD 02 B8 02 C0 02
8040- CD 02 D5 02 E5 02 F2 02
8048- FE 02 0B 03 17 03 23 03
8050- 2F 03 3C 03 49 03 52 03
8058- 5C 03 6B 03 75 03 81 03
8060- 8F 03 9E 03 A9 03 B6 03
8068- C4 03 D2 03 DA 03 E8 03
8070- F7 03 03 04 0F 04 1B 04
8078- 29 04 2F 04 3B 04 4A 04
8080- 53 04 5D 04 66 04 70 04
8088- 7D 04 93 04 B1 04 DD 04
8090- FA 04 2A 05 54 05 6F 05
8098- 8F 05 B4 05 DF 05 0F 06
80A0- 2B 06 3F 06 53 06 7F 06
80A8- A2 06 BA 06 CF 06 EA 06
80B0- 0F 07 45 07 68 07 79 07
80B8- 8B 07 A6 07 BE 07 D1 07
80C0- F1 07 18 08 3C 08 59 08
80C8- 80 08 97 08 A2 08 B1 08
80D0- C6 08 D7 08 EC 08 01 09
80D8- 0C 09 17 09 26 09 35 09
80E0- 3A 09 3F 09 47 09 4C 09
80E8- 53 09 6D 09 82 09 98 09
80F0- B4 09 C6 09 D9 09 E7 09
80F8- FA 09 0C 0A 1A 0A 93 0A
8100- 87 0A C5 0A D2 0A DF 0A
8108- EC 0A DF 0A 00 00 00 00
8110- 00 00 00 00 00 00 00 00
8118- 00 00 00 00 00 00 00 00
8120- 00 00 00 00 00 00 00 00
8128- 00 00 00 00 00 00 00 00
8130- 00 00 00 00 00 00 00 00
8138- 00 00 00 00 00 00 00 00
8140- 00 00 00 00 00 00 00 00
8148- 00 00 00 00 00 00 00 00
8150- 00 00 00 00 00 00 00 00
8158- 00 00 00 00 00 00 00 00
8160- 00 00 00 00 00 00 00 00
8168- 00 00 00 00 00 00 00 00
8170- 00 00 00 00 00 00 00 00
8178- 00 00 00 00 00 00 00 00
8180- 00 00 00 00 00 00 00 00
8188- 00 00 00 00 00 00 00 00
8190- 00 00 00 00 00 18 30 36
8198- B6 04 00 08 18 18 36 0D
81A0- 24 04 00 08 18 18 36 36
81A8- 36 0D 24 24 24 95 1F 1F
81B0- 16 0D 0D 04 00 09 08 18
81B8- 3F BF 0E 2D D5 F1 3F 77
81C0- 21 20 20 20 00 00 18 18
81C8- 37 6D F1 1E 1E 1E 4D 35
81D0- 27 00 89 16 0F 18 0F 18
81D8- 0F 18 0F 18 64 15 B6 1B
81E0- 76 25 00 09 18 00 18 1E
81E8- 1E 04 00 64 0C 96 92 0F
81F0- 1B 0F 18 04 00 E4 1C 96
81F8- 92 0D 18 0D 18 04 00 24
8200- 95 0D 18 16 1F FE 20 A8
8208- 04 00 24 96 6E 08 18 FF
8210- 27 00 32 1E 04 00 28 2D
8218- DF 23 00 92 04 00 08 1B
8220- 48 F6 1E 1E 1E 26 00 0C
8228- 0C 1C 3F 17 36 2E 1E 0E
8230- 2D 0D 18 24 24 00 18 60
8238- 36 36 AE 3F 04 00 0B DB
8240- 63 2D 15 F6 1E 1E 1E 2D
8248- 2D 04 00 0C DB 63 2D 15
8250- F6 0E F6 3F 0F 18 04 00
8258- 4A D6 24 24 24 1E 1E 1E
8260- 2E 25 00 09 00 18 38 3F
8268- 37 2E 2D 15 36 1E 3F 0F
8270- 18 04 00 09 00 18 18 BF
8278- 1E 2E 2D 15 F6 3F 0F 18
8280- 24 00 18 08 18 2C 2D 35
8288- 1E 1E 1E 1E 26 00 3F 20
8290- 0C 2D 15 F6 0E F6 3F 0F
8298- 18 24 00 39 3F 20 0C 2D
82A0- 15 36 F6 1E 27 00 B0 04
82A8- 00 B0 1E 04 00 09 08 18
82B0- 88 17 17 0E 0E 0E 04 00
82B8- 18 20 2D B5 3F 3F 04 00
82C0- 18 00 18 70 0E 0E 1E 1E
82C8- 1E 04 00 08 DB 63 2D 15
82D0- F6 1E 16 04 00 52 09 18
82D8- 24 E4 3F 17 36 36 0E 2D
82E0- E5 38 24 25 00 2D 36 FE
82E8- 18 24 2C 1C 0C 0C 15 15
82F0- 04 00 3F 24 2C 2D 15 F6
82F8- 0E F6 3F 27 24 00 08 58
8300- E1 3F 17 36 36 0E 2D 0D
8308- 18 04 00 1B 24 2C AD 15
8310- 36 1E 1E 3F 24 04 00 FD
8318- 27 24 2D 2D 96 92 3F 3F
8320- 24 04 00 39 27 08 58 09
8328- 3F 3F 36 36 36 04 00 CA
8330- 2D F6 3F 0F 18 24 24 0C
8338- 2D 15 04 00 28 25 08 58
8340- 36 36 36 DF 23 24 24 24
8348- 00 24 3C 0D 96 1A 36 FD
8350- 04 00 08 18 28 F5 36 36
8358- 1E 3F 20 00 08 18 D8 36
8360- 36 36 4D 39 38 38 60 0C
8368- 0C 04 00 08 18 D8 36 36
8370- 36 2D 2D 04 00 64 0C 36
8378- 36 36 DF 23 24 24 AC 04
8380- 00 92 18 24 24 24 95 0E
8388- 0E 56 24 24 24 04 00 08
8390- 18 38 17 36 36 0E 2D 0D
8398- 18 24 24 1C 04 00 92 18
83A0- 24 24 24 2D AD F6 3F 04
83A8- 00 4A 24 E4 3F 17 36 36
83B0- 0E 6D 1C 1C 04 00 92 18
83B8- 24 24 24 2D AD F6 3F 0E
83C0- 0E 0E 04 00 08 58 E1 3F
83C8- 17 76 2D 15 F6 3F 0F 18
83D0- 04 00 92 24 24 24 2D DF
83D8- 27 00 08 18 08 D8 36 36
83E0- 76 2D 0D 18 24 24 24 00
83E8- 08 18 D8 36 36 0E 0E 0D
83F0- 18 0D 18 24 24 04 00 76
83F8- 0E 24 24 24 DF 33 36 36
8400- 2E 20 00 1C 1C 6C 09 F6
8408- 16 0E FE 18 64 04 00 36
8410- 3E 08 18 08 18 1C 6C 09
8418- F6 04 00 28 25 D8 08 18
8420- 2D 2D F6 D6 F3 2E 2D 25
8428- 00 92 98 2D 2D 04 00 98
8430- 12 2D 18 1C 64 2D 15 F6
8438- 2E 04 00 92 18 64 0C 0E
8440- 0E 26 08 18 08 98 DB 1C
8448- 04 00 33 36 0D 24 64 9F
8450- 1F 04 00 92 2D 5C 1C 1C
8458- 1E 1E 2E 04 00 08 18 28
8460- 15 F6 3F 20 04 00 92 24
8468- 24 24 15 15 DF 63 04 00
8470- 18 60 0E 0C 25 8E 13 1E
8478- 1E 1C 1E 04 00 08 18 D8
8480- 36 36 36 25 24 24 2C 36
8488- 36 36 25 24 24 2C 36 36
8490- 36 04 00 08 18 08 18 08
8498- 18 30 2D 2E F5 38 37 3F
84A0- 5E 3F 4E 2D 2E 35 2D DE
84A8- 3F 3E 37 3F 4E 2D 36 04
84B0- 00 08 18 08 18 08 18 30
84B8- 2D 2E F5 38 37 3F 3E 77
84C0- 29 35 2D 2E F5 38 37 3F
84C8- 3E 77 29 35 FE D8 08 18
84D0- 08 18 08 18 00 58 CC 33
84D8- F6 24 24 04 00 08 18 08
84E0- 18 08 18 30 36 36 2D 2D
84E8- F5 D8 18 38 3F 87 2A 2D
84F0- 2D 2D 2D F5 D8 33 36 36
84F8- 04 00 08 18 08 18 08 18
8500- 30 36 36 3E 3F 3F 4E 49
8508- 09 18 2D 2D 96 3F 3F 3F
8510- 3F 3F 4E 49 16 B4 FE DB
8518- 08 18 0C 0C 0C 58 61 0C
8520- 08 0C 0C 0C 36 0F 18 38
8528- 04 00 08 18 08 18 90 12
8530- 2D 20 35 3E 3F 3F 3F 3F
8538- 27 2C 2D 25 D8 2D 2D 2D
8540- 2D E5 DB 24 B4 92 92 12
8548- 2D 2D D5 DB 1B 38 3F 4E
8550- 09 36 26 00 08 18 08 18
8558- 08 18 30 36 2E 2D 2D DE
8560- DB 08 18 3F 3F 56 29 2D
8568- 2D B5 18 3F 56 04 00 08
8570- 18 08 18 08 18 30 36 16
8578- 16 36 36 36 2E 24 24 0C
8580- 18 24 24 24 24 35 36 36
8588- 36 36 77 36 36 04 00 08
8590- 18 08 18 08 18 30 36 2E
8598- 2D F5 D8 0B 18 3F 77 49
85A0- 15 3F 17 2D 2D 15 3F 3F
85A8- 3F 17 2D 2D 2D 2D DE 1B
85B0- 36 36 04 00 08 18 08 18
85B8- 08 18 30 36 2E 2D 2D 28
85C0- E0 DA DB 18 38 3F 17 17
85C8- 0D 40 09 15 3F 17 2D 2D
85D0- 15 3F 3F 3F 17 2D 2D 2D
85D8- 2D DE 1B 36 36 04 00 08
85E0- 18 08 18 08 18 30 36 36
85E8- 2E 2D 25 D8 0D 18 0D 18
85F0- 0D 18 3F 4E B6 D2 DB 1B
85F8- 38 3F 4E 09 15 3F 17 2D
8600- 2D 15 3F 3F 3F 17 2D 2D
8608- 2D 2D DE 1B 36 04 00 28
8610- 0E AD 15 F6 1E F7 4D 49
8618- 24 24 24 24 24 24 24 97
8620- 92 DA 1B 2D 28 20 1C 1C
8628- E7 04 00 08 18 08 18 08
8630- 18 30 36 2E B4 49 F1 1E
8638- 1E 1E 1E 36 36 04 00 3F
8640- 3F 3F 27 48 49 09 20 24
8648- BC 12 B6 92 32 0D 18 36
8650- 36 04 00 08 18 08 18 48
8658- 09 2D 1C 16 DF 08 18 D8
8660- 36 36 2E 2D 2D DE DB 0B
8668- 18 3F 3F 56 29 2D 2D 6D
8670- 12 3F 3F 3F 3F 3F 56 29
8678- 2D 2D F5 1B 36 04 00 49
8680- 49 39 38 1C E7 E7 E7 E7
8688- E7 37 36 6E 2D D5 DB 33
8690- 36 36 0D 2D 1C 16 DF 36
8698- 2E 0D 18 65 65 65 65 65
86A0- 25 00 08 18 08 18 08 18
86A8- 30 36 2E 2D 2D 2D 96 92
86B0- 3F 3F 3F 3F 3F 24 3C 3F
86B8- 27 00 08 18 08 18 08 18
86C0- 30 36 2E 2D 2D 2D 96 92
86C8- 3F 3F 3F 37 36 26 00 49
86D0- 49 09 18 08 18 18 3F 3F
86D8- 3F 3F 3F 37 36 3F B7 92
86E0- 52 49 49 24 24 2D 2D 2D
86E8- 25 00 08 18 08 18 08 18
86F0- 30 36 2D 2D F5 17 DF 0B
86F8- 18 38 3F 77 0E 0E 0E 0E
8700- 0D 18 0D 18 96 3D BF 76
8708- 2D 0D 18 B4 DA 26 00 49
8710- 2D 0D 1E 1E 1E 1E 1E 1E
8718- 1E 1C 1C 1C 1C 0D 0E 0D
8720- 18 15 0C DB DB 18 1C 1C
8728- 0C 0C 0C 96 2B F5 0C 18
8730- 0C 18 00 0C 0C 0C 15 15
8738- 15 15 DF D8 A8 0D 18 15
8740- 4E 09 15 04 00 49 49 09
8748- 18 36 1E F6 1E 1E F7 3F
8750- 0F 18 0F 98 1C 1C 1C E4
8758- 24 0C 64 0C 0D 18 8C 0D
8760- 18 2D 15 75 0E 0E 26 00
8768- DB DB 63 0C 0C 8C 0E 0E
8770- 0E 0E 0E 0E 2D 28 20 20
8778- 00 DB DB 9B 2D 2D 2D 2D
8780- 20 28 28 B0 92 DB 0E 0E
8788- 0E 04 00 DB DB 28 2D 2D
8790- 0D 18 0D 18 0D 18 0D 18
8798- E4 1C 1E 1E 76 96 09 A8
87A0- 0E 58 2D 2D 04 00 DB DB
87A8- 2B 2D 2D 36 36 36 2E 2D
87B0- 2D 2D 2D 24 24 08 18 38
87B8- 1E 1E F6 F6 04 00 09 08
87C0- 18 08 18 08 18 30 0E AE
87C8- 76 0E 25 08 18 20 24 04
87D0- 00 20 24 24 BC 92 12 0F
87D8- 18 3F BF 6F 49 D1 1E 1E
87E0- 1E 1E 1E 4D 49 09 00 18
87E8- 08 18 28 15 15 AE AE 26
87F0- 00 32 36 36 3E 08 18 08
87F8- 18 08 18 17 3F 3F 38 4D
8800- 09 38 38 38 38 38 B0 52
8808- 29 0C 58 6E 91 29 0D 18
8810- 0D 18 2C 20 0D 18 24 00
8818- 32 36 36 3E 08 18 08 18
8820- 08 18 17 3F 3F 38 4D 09
8828- 58 1C 1C 1C 1C 1C 96 4A
8830- 64 6D 92 09 65 0C 2C 20
8838- 0D 18 24 00 92 12 3F 3F
8840- 3F 67 49 49 24 24 24 24
8848- 24 BC 92 92 E0 3F BF 77
8850- 49 49 29 15 15 AE 76 26
8858- 00 DB DB 08 18 08 18 08
8860- 18 2D 2D 2D 35 36 36 36
8868- 36 36 3E 08 18 08 18 08
8870- 18 1E 3F 3F 38 4C 49 49
8878- 2D 20 20 0C 2C 20 04 00
8880- 24 24 24 FC DB 9B 92 92
8888- 2D 2D 2D 2D 2D 2D 2D DE
8890- DB 1B 36 36 36 04 00 49
8898- 49 39 3F 3F 3F 3F 3F 3F
88A0- 27 00 08 18 08 18 08 18
88A8- 30 36 36 36 36 36 36 26
88B0- 00 32 36 36 FE DB 1B 08
88B8- 18 08 18 08 18 28 2D 2D
88C0- 2D 2D 2D 2D 25 00 20 24
88C8- 24 FC DB 9B 92 92 2D 2D
88D0- 2D 2D 2D 2D 2D 04 00 29
88D8- 2D 2D E5 DB DB 08 18 08
88E0- 18 08 18 36 36 36 36 36
88E8- 36 36 04 00 38 3F 3F 27
88F0- 08 18 08 18 08 58 49 49
88F8- 36 36 36 36 36 36 36 04
8900- 00 49 49 39 3F 3F 3F 36
8908- 36 36 26 00 92 92 22 24
8910- 24 24 3F 3F 3F 27 00 08
8918- 18 08 18 08 18 30 36 36
8920- 36 2D 2D 2D 25 00 08 18
8928- 08 18 08 18 30 36 36 36
8930- 3F 3F 3F 27 00 3F 3F 3F
8938- 27 00 36 36 36 26 00 20
8940- 24 24 D4 92 12 04 00 2D
8948- 2D 2D 25 00 08 16 1F 0C
8950- 18 04 00 49 49 09 18 08
8958- 18 08 18 08 18 3F 3F 3F
8960- 3F 3F 3F 3F 36 36 36 36
8968- 36 36 36 04 00 92 92 5A
8970- 49 49 21 24 24 24 24 24
8978- 24 3C 3F 3F 3F 3F 3F 3F
8980- 27 00 08 18 08 18 08 18
8988- 48 49 09 36 36 36 36 36
8990- 36 36 3F 3F 3F 3F 3F 3F
8998- 3F 04 00 08 18 08 18 08
89A0- 18 DB DB 1B 36 36 36 36
89A8- 36 36 36 2D 2D 2D 2D 2D
89B0- 2D 2D 04 00 08 18 08 18
89B8- 08 18 DB DB 1B 36 36 36
89C0- 36 36 36 36 04 00 DB DB
89C8- 08 18 08 18 08 18 08 18
89D0- 2D 2D 2D 2D 2D 2D 2D 04
89D8- 00 DB DB 93 92 12 24 24
89E0- 24 24 24 24 24 04 00 DB
89E8- DB 08 18 08 18 08 18 08
89F0- 18 2D 2D 2D 2D 2D 2D 2D
89F8- 04 00 08 18 08 18 08 18
8A00- 48 49 09 36 36 36 36 36
8A08- 36 36 04 00 49 49 91 92
8A10- 12 3F 3F 3F 3F 3F 3F 3F
8A18- 04 00 92 92 DA DB 1B 2D
8A20- 2D 2D 2D 2D 2D 2D 5C 3F
8A28- 3F 3F 3F 3F 3F 3F 3C 2D
8A30- 2D 2D 2D 2D 2D E5 FD 3F
8A38- 3F 3F 3F 3F 3F 2C 2D 2D
8A40- 2D 2D 2D 2D 25 3F 3F 3F
8A48- 3F 3F 3F 3F 2C 2D 2D 2D
8A50- 2D 2D 2D 25 3F 3F 3F 3F
8A58- 3F 3F 3F 2C 2D 2D 2D 2D
8A60- 2D 2D 25 3F 3F 3F 3F 3F
8A68- 3F 3F 2C 2D 2D 2D 2D 2D
8A70- 2D 25 3F 3F 3F 3F 3F 3F
8A78- 3F 2C 2D 2D 2D 2D 2D 2D
8A80- 25 3F 3F 3F 3F 3F 1F 3F
8A88- 4D DF 28 2D 2D 2D 2D 2D
8A90- 2D 25 00 08 18 08 18 08
8A98- 18 28 2D 2D 2D 36 36 36
8AA0- 36 36 36 36 3F 3F 3F 3F
8AA8- 3F 3F 3F 24 24 24 24 24
8AB0- 24 24 2D 2D 2D 04 00 13
8AB8- 2D 0D 18 E4 3F 17 6E 08
8AC0- 18 20 24 24 00 13 24 5C
8AC8- 29 15 36 1E 27 48 29 2D
8AD0- 25 00 18 2D 15 F6 3F 0F
8AD8- 18 6C 92 36 36 04 00 09
8AE0- 18 36 1E 3F 20 64 B5 DB
8AE8- 3F 3F 04 00 FF CE D5 C1
```

operating modes. From this second level you may save a HIRES screen to disk or load one into memory from disk, and you may enter a new schematic, edit one already in memory, or return to the first menu. If you select the enter or edit mode, you will next see the HIRES screen either blank or with the last schematic you put there. You also will see a small arrow and a three-digit number in the upper-left corner of the screen. The arrow indicates the rotation applied to the next shape to be drawn, and it may be turned by pressing the R key. The three-digit number shows the shape number to plot next.

To plot a shape, move the cursor to the desired place on the screen using the I, J, K, and M keys. Enter the shape number and push P (Plot). Some other available commands are Erase, Finish, and Text. This last command puts you into the text mode so that you can add text to your schematic.

The edit commands in the text mode are similar to those in the diagram mode except that you use the CTRL key to get the function desired. To get the text onto the screen, just type the characters desired and they will be plotted automatically. In both text and diagram modes you can move the cursor through your drawing without affecting the drawing. I have included a comprehensive set of instructions within the program and about two minutes of practice is all you will need to start diagramming. If you don't feel up to entering the EGG utility, you can always use the second method of putting the diagram into your programs.

Get some graph paper (I use paper with half-inch squares). Position the paper with the long side horizontal and draw a grid of half-inch blocks so that you have 16 columns and 12 rows. Draw a heavy line between the second and third row from the bottom. This line is the bottom of the page 1 screen. Starting at the top left, label the first column 15, the second column 30, the third column 45, and so on until the last column is labeled 270. Starting at the top left, label the rows in a similar fashion so that the bottom row is labeled 180. Next you should make copies of this as it is your worksheet for

Program listing 2. This is a listing of the timer program discussed in the text. It works well; give it a try the next time you are playing with a 555 timer chip.

```
10 D$ = "": REM  D$=CONTROL D
12 P =  PEEK (233)
17  IF P = 120 THEN 100
20  PRINT D$;"BLOAD SHAPEFILE 200, A$8000"
30  POKE 232,0: POKE 233,120
100  TEXT : HOME
110 P = 0
160  PRINT "     << 555 TIMER DESIGN PROGRAM >>"
162  PRINT : PRINT "          << BILL SMITH, K3LF>>"
170  PRINT : PRINT
180  PRINT
200  PRINT "FIND COMPONENTS, OUTPUT KNOWN ----- 1"
205  PRINT "FIND OUTPUT, COMPONENTS KNOWN ----- 2"
210  PRINT "END PROGRAM ----------------------- 3"
220  PRINT
260  GET A$
270  IF A$ = "1" THEN 280
271  IF A$ = "2" THEN 280
272  IF A$ = "3" THEN 9999
275  GOTO 260
280  FOR I = 1 TO 15: PRINT : NEXT I
300  HGR
310  GOSUB 4000
320  IF A$ = "1" THEN  GOTO 400
340  IF A$ = "2" THEN  GOTO 700
360  GOTO 200
380  REM  FOLLOWING PART CALCULATES RESISTOR VALUES, GIVEN OPERATING FRE
     Q., DUTY CYCLE, AND CAPACITOR VALUE
400  POKE 34,23
402 Y1 = 21
403  VTAB 24
410  INPUT "FREQUENCY ";F
412  VTAB (Y1)
415  PRINT  TAB( 2);F
418  VTAB 24
420  INPUT "DUTY CYCLE (  50%) ";D
440  IF D   = 50 THEN  GOTO 420
460  IF D   100 THEN  GOTO 420
465  VTAB 24: PRINT
467  VTAB (Y1): HTAB 11
469  PRINT D;"%"
480 T1 = 1 / F * D / 100
500 T2 = 1 / F - T1
510  VTAB 24: HTAB 1
511  PRINT
512  VTAB 24
520  INPUT "VALUE OF C1 IN UF ";C
530  VTAB (Y1): HTAB 16
532  PRINT C
540 R2 = T2 / (0.693 * C / 1000000)
580 R1 = T1 / (0.693 * C / 1000000) - R2
590 R2 =  INT (R2)
600 R1 =  INT (R1)
620  VTAB (Y1): HTAB 23
630  PRINT R1
632  VTAB (Y1): HTAB 32
634  PRINT R2
650  VTAB 24
660  IF R1 + R2   5000000 THEN  PRINT "RESISTOR ARE TOO BIG "
680  INPUT "MENU OR RECALCULATE--M/R ";A$
682  IF A$ = "M" THEN  TEXT : GOTO 10
684 F5 = F:D5 = D:C5 = C:R5 = R1:R6 = R2
686  VTAB 21: PRINT "                                    "
687  VTAB 21
688  PRINT " ";F5; TAB( 11);D5; TAB( 16);C5; TAB( 23);R5; TAB( 32);R6
690  VTAB 22: HTAB 1
691  PRINT "                                    "
694 Y1 = 22
695  GOTO 403
700  REM   FOLLOWING PART CALCUATES OUTPUT, ON TIME, OFF TIME, AND FREQU
     ENCY GIVEN RESISTOR AND CAPACITOR VALUES.
702  POKE 34,22
705 Y1 = 21
710  REM
714  VTAB 24
720  INPUT "ENTER C1 IN UF ";C
724  VTAB (Y1): HTAB 16
728  PRINT C
730  VTAB 24
740  INPUT "ENTER R1 IN OHMS ";R1
746  VTAB (Y1): HTAB 22
748  PRINT R1
750  VTAB 24
760  INPUT "ENTER R2 IN OHMS ";R2
766  VTAB (Y1): HTAB 31
768  PRINT R2
780 T1 = 0.693 * C / 1000000 * (R1 + R2)
800 T2 = 0.693 * C / 1000000 * R2
820 D = T1 / (T1 + T2) * 100
840 D = ( INT (D * 10)) / 10
860 F = 1 / (T1 + T2)
864  IF F   100 THEN 880
866 F =  INT (F)
870  GOTO 900
880 F = ( INT (F * 100)) / 100
900  VTAB (Y1): HTAB 2
905  PRINT F; TAB( 10);D
907 T1 =  INT (T1 * 1000000) / 1000
908 T2 =  INT (T2 * 1000000) / 1000
910  VTAB 23: HTAB 1
915  PRINT "OUTPUT>>HIGH ";T1;" MS   LOW ";T2;" MS"
950  VTAB 24
955  INPUT "MENU OR RECALCULATE M/R ";A$
960  IF A$ = "M" THEN 100
962 F5 = F:D5 = D:C5 = C:R5 = R1:R6 = R2
964  VTAB 21
966  PRINT "                                    "
967  VTAB 21
968  PRINT  TAB( 1);F5; TAB( 10);D5; TAB( 16);C5; TAB( 22);R5; TAB( 31);
     R6
970  VTAB 23
972  PRINT "                                    "
974  VTAB 22
976  PRINT "
988 Y1 = 22
990  GOTO 710
4000  REM  PULSE GEN DIA.
4100  HGR
4110  SCALE= 1
4150  GOTO 4280
4200  REM >>> SUBROUTINE TO PRINT P$ AS TEXT ON HIRES SCREEN
4210 P =  LEN (P$)
4220  FOR I = 1 TO P
4230  IF  ASC ( MID$ (P$,I,1)) = 32 THEN 4260
4240  DRAW  ASC ( MID$ (P$,I,1)) - 31 AT X,Y
4260 X = X + 7
4270  NEXT I
4275  RETURN
4280  REM  HEADER ON HIRES DRAWING
4300 P$ = "         PULSE GENERATOR DESIGN"
4310 X = 3:Y = 5: GOSUB 4210
4330 Y = Y + 9:X = 70
4340 P$ = "555 TIMER CHIP"
4350  GOSUB 4210
4500  REM  <<< DRAW SCHEMATIC >>>
4510  DRAW 130 AT 135,30: DRAW 107 AT 120,45: DRAW 104 AT 135,45: DRAW 1
     08 AT 150,45
4520  DRAW 102 AT 105,120: DRAW 71 AT 150,120: DRAW 74 AT 105,135: DRAW
     74 AT 150,135
4530  DRAW 107 AT 105,60: DRAW 106 AT 120,60: DRAW 69 AT 150,60
4570  DRAW 116 AT 105,75: DRAW 117 AT 120,75: DRAW 101 AT 135,75: DRAW 1
     06 AT 150,75
4580  DRAW 129 AT 75,90: DRAW 101 AT 90,90: DRAW 122 AT 105,90: DRAW 124
      AT 120,90: DRAW 108 AT 135,90: DRAW 69 AT 150,90
4590  DRAW 119 AT 105,105: DRAW 118 AT 120,105: DRAW 104 AT 135,105: DRAW
     106 AT 150,105
4600  REM  <<< LABEL SCHEMATIC >>>
4650 X = 145:Y = 30:P$ = "B+": GOSUB 4210
4655 X = 160:Y = 60:P$ = "R1": GOSUB 4210
4660 X = 160:Y = 90:P$ = "R2": GOSUB 4210
4665 X = 160:Y = 120:P$ = "C1": GOSUB 4210
4670  DRAW 24 AT 131,80
4675  DRAW 23 AT 131,95
4680  DRAW 19 AT 131,110
4685  DRAW 18 AT 100,116
4690  DRAW 20 AT 92,85
4695  DRAW 21 AT 109,64
4700  DRAW 25 AT 124,64
4945 X = 35:Y = 80
4950 P$ = "SIGNAL"
4955  GOSUB 4210
4960 X = 50:Y = 89
4965 P$ = "OUT"
4970  GOSUB 4210
4975 P$ = "  FREQ   DUTY   C1      R1        R2"
4980 X = 3:Y = 147: GOSUB 4210
4990 P$ = "   HZ   CYCLE   UF     OHMS      OHMS"
4995 X = 3:Y = 155: GOSUB 4210
5999  RETURN
9999  END
```

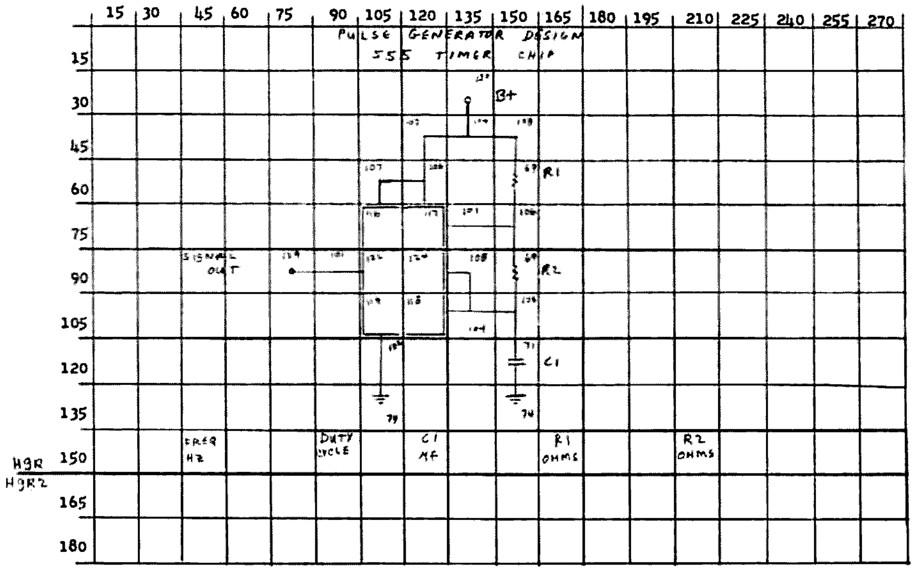

Fig. 3. Example of the worksheet discussed in the text. The diagram is that of the schematic used in the timer program listed with this article.

drawing and inputting schematics. (See Fig. 3.)

As an example of how to correctly use the worksheet, I have included my timer program in Fig. 3 and will step you through the procedure for implementing the schematic in that program. Notice that each shape making up the circuit is centered within a block so that its leads will exit in the middle of a side rather than at a corner. First, draw the diagram on the worksheet using only shapes from the shapefile. Next, label each shape with its corresponding number. Now enter any labels or text desired.

The next step is to enter the worksheet information into your program. In my example program (Program listing 2), the HIRES portion is located beginning on line 4000 and extends to the end of the program. Lines 4500 through 4590 draw the actual shapes. The easiest way to do this is draw all of the shapes on each worksheet row using one program line. This speeds up the programming process considerably when it comes to editing. Sometimes, when a row has only one shape, I will include that shape with the next row (such as line 4510 which draws the shapes for rows 30 and 45).

Lines 4200 through 4275 are a subroutine which makes the printing of text very easy. It takes the string P$ and prints it with normal character spacing beginning at the last values of X and Y. This subroutine will allow you to input only one line of text at a time. Additional

Program listing 3. Here is the EGC draw-and-edit program listing. See text for a description of how it works.

```
10  HOME :D$ =  CHR$ (4): DIM N(4): DIM N$(4)
50  FOR I = 1 TO 4:N(I) = 17:N$(I) = "0": NEXT I
100 P =  PEEK (233): HCOLOR= 3: SCALE= 1
110  IF P = 128 THEN 500
125  PRINT D$;"BLOAD SHAPEFILE 200,A$8000"
130  POKE 232,0: POKE 233,128
500  HOME : PRINT
510  PRINT "    ELECTRONIC GRAPHICS GENERATOR    "
512  PRINT : PRINT "         BY BILL SMITH, ...      "
520  PRINT : PRINT : PRINT
530  PRINT "HIRES PAGE 1 + TEXT           - 1"
532  PRINT "HIRES PAGE 1 FULL SCREEN      - 2"
534  PRINT "HIRES PAGE 2 -----------      - 3"
536  PRINT "INSTRUCTIONS ------------     - 4"
538  PRINT "END ----------------------    5"
540  PRINT
560  GET M$:M =  VAL (M$)
560  ON M GOTO 1000,2000,3000,4000,5000
570  GOTO 550
700  PRINT : PRINT : PRINT
710  PRINT "INPUT NEW SCHEMATIC ------   1"
720  PRINT "EDIT SCHEMATIC IN MEMORY ---  2"
730  PRINT "SAVE DIAGRAM TO DISK ---      3"
740  PRINT "LOAD DIAGRAM FROM DISK ----   4"
750  PRINT "RETURN TO MAIN MENU -----     5": PRINT
799  RETURN
1000  HOME
1010  PRINT "======================="
1012  PRINT "HIRES PAGE 1 + TEXT"
1014  PRINT "======================="
1020  GOSUB 700
1030  GET M$:M =  VAL (M$): PRINT
1050  ON M GOTO 1200,1400,1500,1600,500
1200 FS% = 1: HGR : GOSUB 6000
1300  TEXT : GOTO 1000
1400  IF FS% = 1 THEN 1450
1410  PRINT : INVERSE : PRINT "      NO DIAGRAM IN MEMORY      ": NORMAL :
      FOR I = 1 TO 400: NEXT I: GOTO 1000
1450  POKE - 16301,0: POKE - 16300,0: POKE - 16297,0: POKE - 16304,
     0: GOSUB 6000
1480  TEXT : GOTO 1000
1500  GOSUB 8000
1510  GOTO 1000
1600  HGR :FS% = 1: POKE - 16303,0: POKE - 16300,0: GOSUB 8100
1610  HOME : GOTO 1000
2000  HOME
2010  PRINT "=========================="
2012  PRINT "HIRES PAGE 1 - FULL SCREEN"
2014  PRINT "=========================="
2020  GOSUB 700
2030  GET M$:M =  VAL (M$): PRINT
2050  ON M GOTO 2200,2400,2500,2600,500
2200 FS% = 2: HGR : POKE - 16302,0: GOSUB 6000
2300  TEXT : GOTO 2000
2400  IF FS% = 2 THEN 2450
2410  PRINT : INVERSE : PRINT "      NO DIAGRAM IN MEMORY      ": NORMAL :
      FOR I = 1 TO 400: NEXT I: GOTO 2000
2450  POKE - 16304,0: POKE - 16302,0: POKE - 16300,0: POKE - 16297,
     0: GOSUB 6000
2480  TEXT : GOTO 2000
2500  GOSUB 8000
2550  GOTO 2000
2600  HGR :FS% = 2: POKE - 16297,0: POKE - 16300,0: GOSUB 8100
2610  HOME : GOTO 2000
3000  HOME
3010  PRINT "=============="
3012  PRINT "HIRES PAGE 2"
3014  PRINT "=============="
3016  GOSUB 700
3030  GET M$:M =  VAL (M$): PRINT
3050  ON M GOTO 3200,3400,3500,3600,500
3200 FS% = 3: HGR2 : GOSUB 6000
3300  TEXT : GOTO 3000
3400  IF FS% = 3 THEN 3450
3410  PRINT : INVERSE : PRINT "      NO DIAGRAM IN MEMORY      ": NORMAL :
      FOR I = 1 TO 400: NEXT I: GOTO 3000
3450  POKE - 16302,0: POKE - 16299,0: POKE - 16297,0: POKE - 16304,
     0: GOSUB 6000
3480  TEXT : GOTO 3000
3500  GOSUB 8000
3550  GOTO 3000
3600  HGR2 :FS% = 3: POKE - 16303,0: POKE - 16300,0: GOSUB 8100
3610  HOME : GOTO 3000
4000  HOME : REM   INSTRUCTIONS
4100  PRINT "           ";: INVERSE : PRINT " INSTRUCTIONS ": NORMAL
     : PRINT
4110  PRINT "       ";: INVERSE : PRINT " HIRES SCHEMATIC SHAPES ": NORMAL
     : PRINT : PRINT : PRINT
4120  PRINT " I --------- CURSOR UP": PRINT " J ---------- CURSOR LEFT":
      PRINT " K ---------- CURSOR RIGHT": PRINT " M ---------- CURSOR DOW
     N": PRINT
4130  PRINT " R ---------- ROTATE SHAPE (SEE ARROW)": PRINT " E ----------
     - ERASE": PRINT " F ---------- FINISH (RETURN TO MENU)": PRINT " P
     ---------- PLOT SHAPE": PRINT " T ---------- TEXT MODE ": PRINT
4140  PRINT "0-9 ---------- ENTER SHAPE NUMBER"
4150  GOSUB 4300
4200  HOME : PRINT "             ";: INVERSE : PRINT " INSTRUCTION ": NORMAL
     : PRINT
4210  PRINT "           ";: INVERSE : PRINT " HIRES TEXT MODE ": NORMAL
     : PRINT
4220  PRINT "CTRL:": PRINT "     I ---------- CURSOR UP": PRINT "     J
     ---------- CURSOR LEFT": PRINT "     K ---------- CURSOR RIGHT": PRINT
     "     M ---------- CURSOR DOWN": PRINT
4230  PRINT "     R ---------- ROTATE TEXT": PRINT "     E ---------- ERA
     SE": PRINT "     F ---------- FINISH (GO TO SHAPES)": PRINT
4240  PRINT "ESC - MOVE CURSOR ONE PIXEL ONLY": PRINT : PRINT "     I -
     --------- CURSOR UP": PRINT "     J ---------- CURSOR LEFT": PRINT "
         K ---------- CURSOR RIGHT": PRINT "     M ---------- CURSOR DOW
     N"
4250  GOSUB 4300
4260  GOTO 500
4300 P =  PEEK ( - 16384): POKE - 16368,0: IF P < 127 THEN  RETURN
4310  GOTO 4300
5000  PRINT "5000": END
6000  REM  SUBROUTINE TO DRAW SHAPES
6010 X = 0:Y = 15: ROT= 0:N0 = 0:FP% = 0: XDRAW 66 AT X,Y:X1 = 12
6020  FOR I = 1 TO 4:N$(I) = "0":N(I) = 17: NEXT I
6060  FOR I = 2 TO 4: XDRAW 17 AT X1,7:X1 = X1 + 7: NEXT
6110 C1 = 1
6150 X = X + 15: IF X < 270 THEN 6200
6170 X = 15:Y = Y + 15: IF FS% = 1 AND Y = 165 THEN Y = 15
6180  IF Y = 195 THEN Y = 15
6200  XDRAW 127 AT X,Y: IF C1 = 1 THEN C1 = 2: GOTO 6250
```

lines may be processed automatically by incrementing Y when the value of X gets to 274. Lines 4280 through 4350 print the header on the diagram using P$ and the line 4200 subroutine. Lines 4600 through to the end are the labels for the schematic and the remainder of the text on the HIRES screen.

The schematic for my timer program is small enough so that I was able to use HIRES page 1 and use the four text lines at the bottom for my calculations. This is a very convenient setup as I can see the diagram at the same time I am calculating values. To get the most out of the four lines below the HIRES screen, I put the column headings directly on the HIRES screen at the bottom. Most of my programs with schematics require that the calculations be displayed on page 1 of text while the schematic is on the full-screen HIRES page 2. In these programs I include a small subroutine which allows me to flip between the schematic and the calculations. This is accomplished by checking each input to the calculations for an ESC. When one is encountered, use the "soft switches" described on pages 12 and 13 of the Apple reference manual to display the desired HIRES page. To return to the calculations, use the same system. Check for the ESC key to be depressed, then use the soft switches to display text page 1. This method will leave your calculations intact while you examine the circuit and you will have to draw the circuit only once as it is preserved unchanged.

Most of the shapes in the shapefile are self-explanatory, but there are a few requiring comments. Shape 70 is a variable resistor. If you connect a lead to the left side, it will appear as a regular potentiometer. Shape 79 can be used for coils, transformers, or chokes. Shapes 84, 85, and 86 are leads to be used with the op amp, shape 83. Using these leads will allow you to connect the op amp to other components using the standard configuration. Shape 88 is a bridge rectifier, while shape 89 can be used for meters and other round items.

Shapes 93 through 99 are for transistors and FETs. To draw a transistor, you must combine four shapes, but they make very nice transistors. I use shapes 116 through 119 to draw ICs.

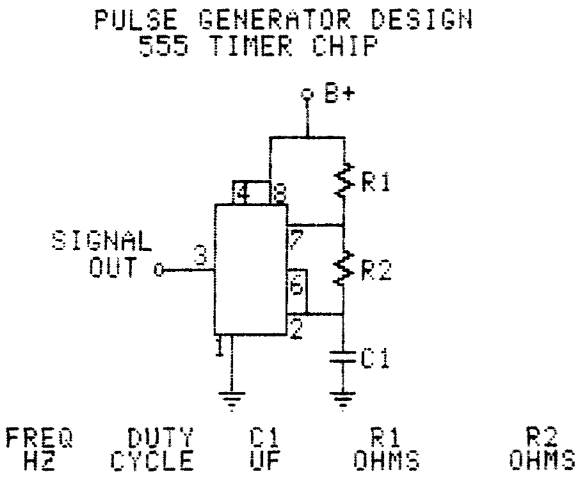

Fig. 4. Actual HIRES screen of the schematic used in the timer program. See Fig. 3 for the worksheet used to develop this schematic.

```
6220 C1 = 1
6250  FOR K = 1 TO 15:P =  PEEK ( - 16384): NEXT
6280  POKE  - 16368,0
6300  IF P < 127 THEN 6200
6310  IF P  175 AND P < 186 THEN  GOSUB 6800
6350  IF C1 = 2 THEN  XDRAW 127 AT X,Y:C1 = 1
6360  IF P = 160 THEN 6110: REM  SPACE BAR
6370  IF P <  > 208 THEN 6380: REM  PLOT
6375  IF N0  1 AND N0 < 132 THEN  ROT= FR%: XDRAW N0 AT X,Y: GOTO 6110

6380  IF P = 155 THEN 7000: REM  ESC TO TEXT
6410  IF P <  > 201 THEN 6430: REM  I
6415 Y = Y - 15
6418  IF Y = 0 AND FS% = 1 THEN Y = 150
6420  IF Y = 0 THEN Y = 180
6425  GOTO 6200
6430  IF P <  > 202 THEN 6450: REM  J
6440 X = X - 15: IF X = 0 THEN X = 15
6445  GOTO 6200
6450  IF P = 203 THEN 6110: REM  K
6470  IF P <  > 205 THEN 6490: REM  M
6480 Y = Y + 15: IF Y = 165 AND FS% = 1 THEN Y = 15
6482  IF Y = 195 THEN Y = 15
6485  GOTO 6200
6490  IF P <  > 197 THEN 6510: REM  E
6495 M%((X / 15),(Y / 15)) = 0: DRAW 126 AT X,Y: XDRAW 126 AT X,Y: GOTO
     6200
6510  IF P <  > 210 THEN 6530: REM  R
6515  XDRAW 66 AT 3,3
6520 FR% = FR% + 16: IF FR% = 64 THEN FR% = 0
6528  ROT= FR%: XDRAW 66 AT 3,3: GOTO 6200
6530  IF P <  > 198 THEN 6540: REM  F
6535  FOR I = 0 TO 8: DRAW 68 AT ((I * 5) + 3),3: XDRAW 68 AT ((I * 5) +
     3),3: NEXT : RETURN
6540  IF P = 211 THEN 6700: REM  SHIFT
6699  GOTO 6200
6700  REM  MOVE ROUTINE
6710  GOTO 6200
6800 N(1) = P - 159
6810 X1 = 10:Y1 = 3: ROT= 0
6820  FOR I = 4 TO 2 STEP  - 1: XDRAW N(I) AT X1,3:N(I) = N(I - 1): XDRAW
     N(I) AT X1,3:X1 = X1 + 7: NEXT
6890  ROT= FR%
6910  FOR I = 1 TO 4:N$(I) =  STR$ (N(I) - 17): NEXT I
6920 NO$ = N$(4) + N$(3) + N$(2):N0 =  VAL (NO$): ROT= FR%
6999  RETURN
7000  REM  PROCESS TEXT
7010 X2 =  - 3:Y2 = 11
7090 C2 = 1
7100 X2 = X2 + 6: IF X2 > 274 THEN 7200
7120 X2 = 3:Y2 = Y2 + 8
7130  IF Y2  155 AND FS% = 1 THEN Y2 = 11
7140  IF Y2 > 187 THEN Y2 = 11
7200  XDRAW 68 AT X2,Y2
7210  IF C2 = 1 THEN C2 = 2: GOTO 7230
7220 C2 = 1
7230  FOR I = 1 TO 20:P =  PEEK ( - 16384): NEXT I: POKE  - 16368,0
7250  IF P < 127 THEN 7200
7260  IF C2 = 2 THEN  XDRAW 68 AT X2,Y2: IF C2 = 2 THEN C2 = 1
7400  IF P  160 AND P < 221 THEN  GOTO 7800
7410  IF P = 221 THEN 7120
7420  IF P = 160 THEN 7100
7430  IF P <  > 136 THEN 7440
7435 X2 = X2 - 6: IF X2 < 3 THEN X2 = 3
7436  DRAW 68 AT X2,Y2: XDRAW 68 AT X2,Y2: GOTO 7200
7440  IF P = 149 THEN X2 = X2 + 6: IF X2  275 THEN X2 = 275: GOTO 7200

7450  IF P <  > 137 THEN 7460
7455 Y2 = Y2  8: IF Y2  11 THEN Y2 = 11: GOTO 7200
7460  IF P  138 THEN 7470
7465 X2 = X2  6: IF X2  3 THEN X2 = 3: GOTO 7200
7470  IF P  139 THEN 7480
7475 X2 = X2 + 6: IF X2  274 THEN X2 = 274: GOTO 7200
7480  IF P  141 THEN 7490
7485 Y2 = Y2 + 8: IF Y2  155 AND FS% = 1 THEN Y2 = 155: IF Y2  188 THEN
     Y2 = 188: GOTO 7200
7490  IF P  155 THEN 7550
7500  GET E$:E =  ASC (E$)
7510  IF E  73 THEN 7520
7515 Y2 = Y2 - 1: IF Y2  11 AND FS% = 1 THEN Y2 = 154: IF Y2  11 THEN
     Y2 = 188
7516  GOTO 7200
7520  IF E  74 THEN 7530
7525 X2 = X2  1: IF X2  3 THEN X2 = 3
7526  GOTO 7200
7530  IF E  75 THEN 7540
7535 X2 = X2 + 1: IF X2  275 THEN X2 = 275
7536  GOTO 7200
7540  IF E  77 THEN 7550
7545 Y2 = Y2 + 1: IF Y2  154 AND FS%  1 THEN Y2 = 11: IF Y2  188 THEN
     Y2 = 11
7546  GOTO 7200
7550  IF P  132 THEN 7560
7555  DRAW 68 AT X2,Y2: XDRAW 68 AT X2,Y2: GOTO 7200
7560  IF P  130 THEN 7570
7565  XDRAW 68 AT X2,Y2: GOTO 7100
7570  IF P = 174 THEN  GOTO 6200
7580  IF P  146 THEN 7600
7585  XDRAW 66 AT 3,3:FR% = FR% + 16: IF FR%  64 THEN FR% = 0
7586  ROT= FR%: XDRAW 66 AT 3,3: GOTO 7200
7600  GOTO 7200
7800  XDRAW P  159 AT X2,Y2: GOTO 7100
8000  PRINT : PRINT : INPUT "ENTER FILE NAME (M FOR MENU) ";F$
8010  IF F$ = "M" THEN  RETURN
8020  IF FS% = 3 THEN 8040
8025 F$ = "BSAVE " + F$ + ",A$2000,L$2000"
8030  PRINT D$;F$: HOME : RETURN
8040 F$ = "BSAVE " + F$ + ",A$4000,L$2000"
8050  PRINT D$;F$: HOME : RETURN
8100  PRINT : PRINT : INPUT "ENTER FILE NAME TO LOAD (M - MENU) ";F$
8110  IF F$ = "M" THEN  RETURN
8120  IF FS% = 3 THEN 8150
8125  ONERR  GOTO 8190
8130 F$ = "BLOAD " + F$ + ",A$2000"
8140  PRINT D$;F$
8146  RETURN
8150 F$ = "BLOAD " + F$ + ",A$4000"
8155  ONERR  GOTO 8190
8160  PRINT D$;F$
8180  RETURN
8190  PRINT : INVERSE : PRINT "   FILE NOT FOUND   ": NORMAL : FOR I =
     1 TO 800: NEXT I
8194  IF FS% = 1 THEN  GOTO 1000
8195  IF FS% = 2 THEN  GOTO 2000
8196  IF FS% = 3 THEN  GOTO 3000
```

This allows enough room to label the pins clearly. The remainder of the shapes should be fairly self-explanatory, and if you are not sure about what a shape does, just try drawing it on your computer. If you want to add shapes to your shapefile, you should consult your Apple reference manuals and be familiar with shapetables. To conform to my system, the new shape should be drawn on a 15 × 15 grid and the origin of the shape should lie at the center (coordinates 8,8). Also remember to have all leads exit at the middle of a side. In setting up the shapetable listed here, I used a program from *Micro Magazine*, September, 1980, called "Creating Shape Tables, Improved," by Peter A. Cook.

I have listed the shapefile beginning at $8000. Note the $00 beginning at $810c and extending to $8193. These 00s are necessary for proper operation, and this is the space set aside to address additional shapes which might be added to the end of the table in the future. If you enter this shapetable by hand, you can edit the shapes by remembering that each shape is separated by a hex 00. If you have a problem with, for example, shape #9, find the ninth set of hex 00s in the listing and you will be looking in the correct area. This shapefile is quite lengthy so I will make a copy available on disk. If you send me $12.00, I'll send you a copy of the shapefile and the EGG utility program. In addition, I will include a copy of the timer program and a couple of copies of my worksheet. The timer program and the EGG utility are written in Applesoft BASIC and recorded using DOS 3.3. I hope you get as much utility out of my EGG as I have; it will add a whole new dimension to your programs with a minimum of effort. ■

Trade Secrets of Mobile Installation

Mounting a rig in your car is not as hard as it seems. Find out how the pros do it.

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Installing presently-popular amateur transceivers in the limited space of today's cars can often prove to be a hair-raising experience. While slide-in mounts and rig-hanging brackets may be readily available for some units, these mounts often place their respective rigs in rather awkward positions. When the rig is removed from the car, the unused mount or bracket may continue to occupy vital interior room and thus further emphasize the need for a more flexible arrangement.

The mounting techniques presented in this article will attempt to alleviate those problems and provide a simple yet effective means of containing the rig in a desired location. Since the majority of mobile installations are usually more involved than merely placing a transceiver in the car, I'll also briefly consider antenna cabling and dc power-cord routing. Amateurs following these general guidelines should be able to progress from a "stock" new car to a complete mobile installation in less than an hour's time (assuming everything needed isn't buried at the bottom of a junkbox!).

Rig Location/ Mounting Ideas

An amateur owning a large automobile with a full-width dash, bench-type seat, and no center console

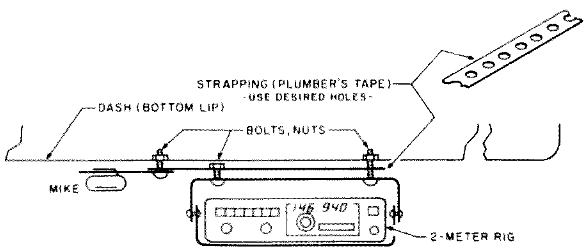


Fig. 1. Method of using strapping to mount a rig under the dash, using existing holes. Screw and nut sandwiched between the dash bottom; strapping should be short and thin for snug mounting and to prevent scratching the rig. The mike holder can be screw-mounted to one of the holes in the strapping.

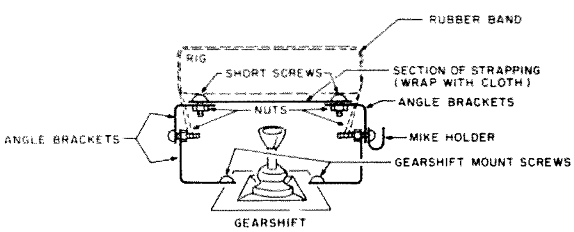


Fig. 2. Method of using hardware-store L-brackets and metal strapping for a universal mount on small autos. Rig's front sits on the covered strap and is held securely by a rubber band. Brackets may be tilted as desired.

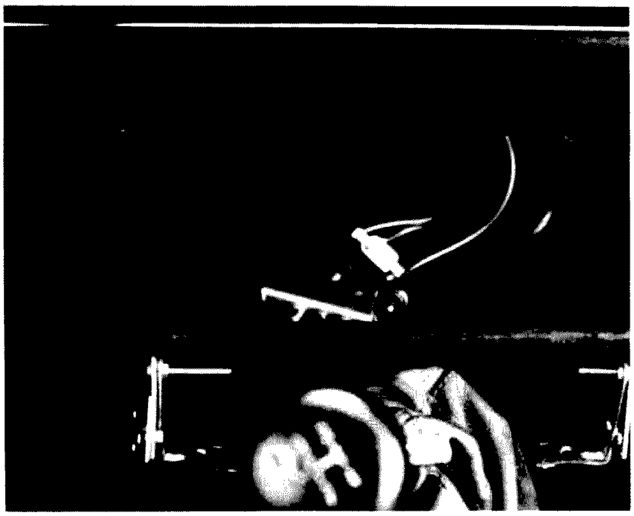


Fig. 3. The home-brew mount. Note the power connectors for various rigs in the background.

Fig. 4. Low-band transceiver is side-slid into position with its front feet catching on the bracket. The rear of the rig is sitting on the transmission hump. The squeezed position assists in securing the rig, eliminating need for a hold-down strap.

Fig. 5. This rig-mounting bracket is ideally suited to rapid installation artists. The unit is merely placed on the mount and secured with a heavy rubber band. Either top or bottom-mounted speakers can be used with this arrangement.

will experience few problems mounting his rig or rigs. If existing holes in the under-dash lip don't align with the rig mounting bracket, a section of metal strapping (plumber's tape) can be used as a "hole relocator." This arrangement is shown in Fig. 1. The rig's rear area can rest lightly on the auto's carpet, if necessary, and a small chock can be used if thick carpeting blocks air flow around heat sinks.

Mounting 2-meter FM-sized transceivers (and possibly small-sized low-band transceivers) in compact autos exhibiting miniscule dash-to-transmission-hump clearance can prove to be difficult. The most logical solutions here involve using home-brew brackets and existing supports for maximum benefit. One example of this technique is shown in Fig. 2. Four L-brackets are bolted together as shown, with heavy metal strapping bolted between the upper L-brackets. The lower L-brackets are secured to the auto's gearshift mounting L-plate via existing screws. These are slightly underneath the floor shift's rubber boot in autos such as the Sunbird, Monza, Skyhawk, etc.; squeezing the boot's bottom will reveal the screws. The upper L-brackets' size and angle of tilt can be varied as desired for proper rig positioning. In order to prevent rig scratches, cover the brackets' upper area with a couple of layers of cloth matching the auto's interior, and sew the cloth tight.

This mount can be used with a variety of rigs, depending on the particular auto's hump-to-dash clearance. A 2-meter rig, for example, can be placed on the mount and secured in place by a rubber band stretched between the long L-bracket screws. (How's that for a quick install/remove caper?) An HF rig such as the Atlas, Kenwood TS-120, etc., can also be side-slid into this bracket by positioning its front feet in front of the covered metal strap while the dash itself secures the rig from its topside (the rig's rear then rests on the transmission hump). Other rigs can also be used with this L-bracket setup merely by securing them with a rubber band when necessary. A small towel the same color as the auto's carpet can be used to cover or camouflage the rig during brief out-of-car stops.

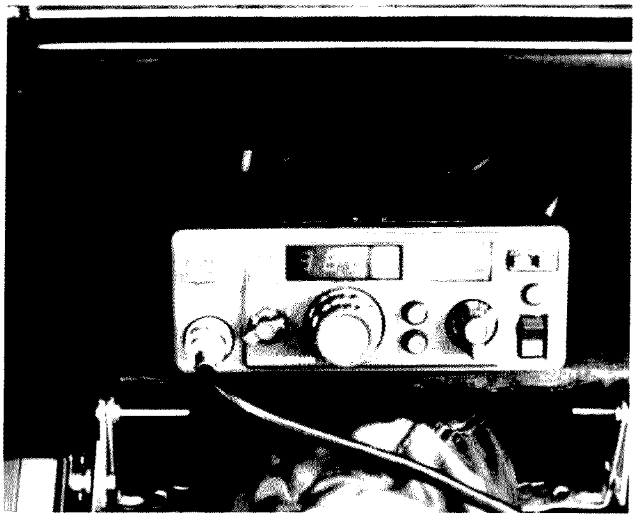


Fig. 6. A second (or third!) rig can be used with the bracket of Fig. 5. If front feet don't secure the rig, use a heavy rubber band. Note the mike mount on the left side of the bracket.

(Be aware, however, that any out-of-view auto is open prey to rip-off artists).

Many small and intermediate-sized autos feature bench-style seats and one-piece dashes which can support 2-meter FM rigs, but may present problems for securely supporting larger HF rigs. An effective mounting idea for these autos involves propping the HF rig between the front seat's edge and the transmission's hump, securing it with a cloth-covered boat tie-down strap as shown in Fig. 7. If connecting cables dig into the carpet or if the rig's heat sink is slightly obstructed, a small piece of wood or indoor/outdoor carpet may be used for chocking. All rig cables and the tie-down strap can merely be pushed under the seat when not in use, providing a perfectly clean-looking interior. Cloth-covered tie-down straps are

available from boating supply or sporting goods stores, with most stores boasting on-the-spot assembly of the tie-down in any desired length. The highest price I have found on tie-downs is $3.00 each.

Fig. 7. Mobile installation of traveling amateur W4CEC consists of an Azden 2-meter rig and Kenwood TS-120. The 120 is merely propped on the auto's seat; its tilt-down front bail secures the unit and eliminates the need for a tie-down strap. The Azden is secured, complete with bracket, by a tie-down strap hooked under the dash. Clever and convenient, and both rigs can be removed in a snap.

Two special-consideration-type mounts which may be applicable to small autos with center consoles involve mounting a mobile rig sideways on either the console or the drive-shaft tunnel right behind the rider's seat. This arrangement is illustrated in Fig. 8. Surprisingly, the front mounting often will support a large low-band rig while the rear mount supports a 2-meter rig.

Routing Cables

Today's tightly-assembled autos can prove quite challenging to cable routing, but a few tricks of the trade can simplify that situation. Antenna transmission line can easily be routed through the auto's trunk area by moving the rear seat on the rider's side and poking part of a stiff, discarded whip antenna through to the trunk. Next, tape the coaxial cable to the end of that whip and pull it into the auto's interior. (Use heavy-duty filament tape and help the cable along for first-try success.) Additional cables, if desired, can then be taped to the initial cable and pulled through in a similar manner. Routing cables on the auto's right (rider) side also is good due to the absence of steering wheel, floor pedals, etc.

The whip-antenna trick is also useful for passing power cords through auto firewall openings. The most logical and convenient opening to use is the expandable grommet through which the speedometer cable passes. Again, poke the whip into the auto's interior, tape the cable to the whip rod's tip and pull it back through the grommet, helping it as necessary.

Finally, make a composite resistance check in the following manner to ensure solid ground connections. Short the antenna's center conductor and shield at the antenna proper, then measure from the power cord's negative lead, through the auto body, through the antenna mount, and back to the center conductor of the PL-259 for less than 1 Ohm's resistance. At this point, you are ready to check alternator/battery voltage with the motor running to ensure that less than 14 volts is delivered . . . and then connect the rig.

Conclusion

The techniques of mounting amateur gear in autos varies with each set of circumstances, yet each installation can be made easier by using ideas tried and proven by others. I hope this collection of thoughts and views will prove helpful in both the installation and operation of your existing or future mobile rigs. ■

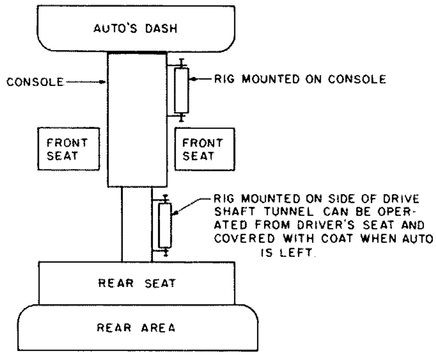
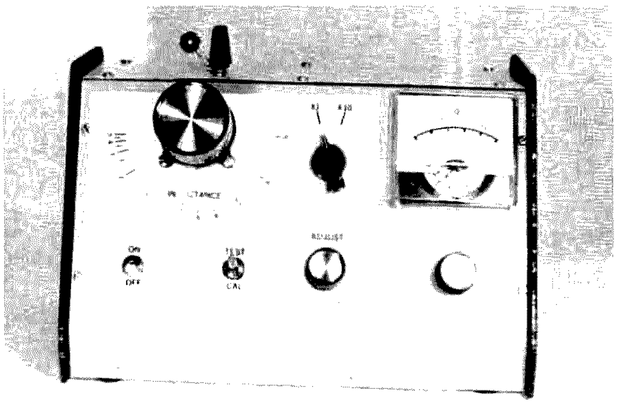


Fig. 8. Two rig-mounting locations for small autos which provide flexibility and a degree of security. Location behind rider's seat is preferred for small 2m FM units.

Around and Around and Around

There's got to be a better way to wind your coils to specs. Build the Q-meter and get the exact inductance you need.

Edwin C. Miller N7APE
306 W. Court Street
Weiser ID 83672

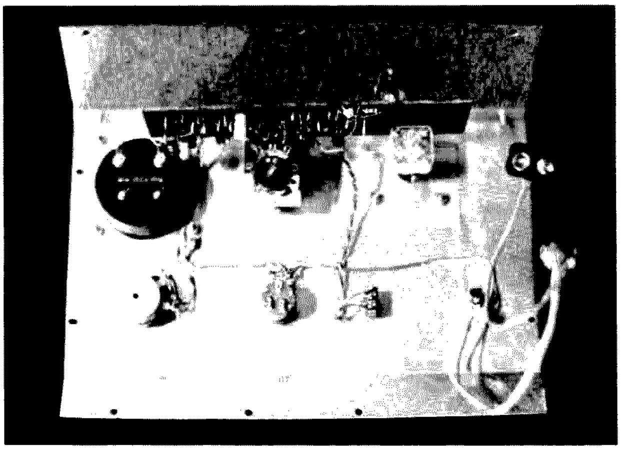


Front view of completed Q-meter.

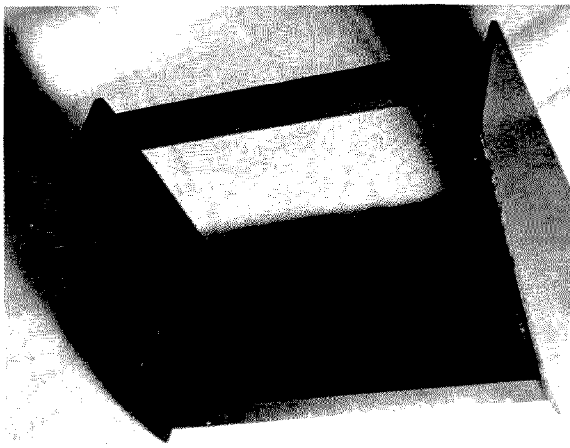
Winding coils for a new project seems to be one of the more frightening aspects of the job. One reason may be the fear that we may not be able to duplicate the author's model. If we have a way to check each coil before it's installed, much of the apprehension is removed. A "Q"-meter will do this by measuring the coil's inductance and Q. The unit pictured is such a Q-meter that will measure inductances from .5 uH to 50 uH and Qs to 200. It's easy to build, easy to operate, and is powered by an internal 9-volt battery or wall-plug power supply.

There are four basic parts to this Q-meter: a dual-frequency rf oscillator, an FET voltmeter, a power supply, and the tank circuit that indicates the inductor of unknown value (L_X).

Fig. 1 is the schematic. A 2N2222 transistor serves as the rf oscillator, followed by an MPF-102 JFET buffer. The range of measurement is controlled by the oscillator frequency and the tank variable capacitor. With the capacitor specified, the range is .5 to 5 uH at a frequency of 20.05 MHz, and 5 to 50 uH at 6.34 MHz. The two toroid coils resonate with C1 and C2 to produce these frequencies, and S1 determines the range in use. The buffer stage provides the neces-



Assembled panel and top plate showing component mounting.



Pine and Masonite™ case for the Q-meter.

sary low impedance excitation for the tank circuit through C8. A 1N270 germanium diode (D1) rectifies the rf output of the buffer and is used to calibrate the meter before taking a measurement. A hot-carrier diode (D2) is placed across the variable capacitor and rectifies the tank circuit current to provide a dc voltage that is proportional to the Q of L_x at resonance. It is this voltage that is measured in the TEST position of S2.

The JFET voltmeter uses two MPF-102 JFETs, zeroed by R15. Full scale on the meter should be 250 microamps or less. The critical components have been selected so that the Q reading will be quite accurate if 100 is used as the calibration reference. The meter I used is calibrated from zero to 250 and is a 200-uA movement. A more sensitive meter will require using a higher resistance setting of R12, but will not affect the unit's accuracy. Qs of 250 or more are seldom required and are difficult to obtain, so there is not much need to have a higher scale.

As for construction, there is really only one critical portion—the mounting of the tank components (C9, C10, and the terminals for L_x). At 50 uH, an inch or two of extra wire will not have much effect on accuracy, but at .5 uH, the leads must be kept as short as possible. This is one reason for the miniature variable capacitor and small unit for C9. The terminals for L_x consist of 4-40 bolts mounted directly to the Formica™ top, using solder lugs to connect to the circuit board components and 4-40 hex nuts fastened by epoxy to small wire nuts for holding the unknown inductor leads. Small 5-way connectors should also work fine. Although I used an import vernier dial mechanism and attached a plastic pointer, a non-reduction knob will work quite well—it's just a little harder to get right on resonance. The shaft of C10 is too short to reach the panel. It can be

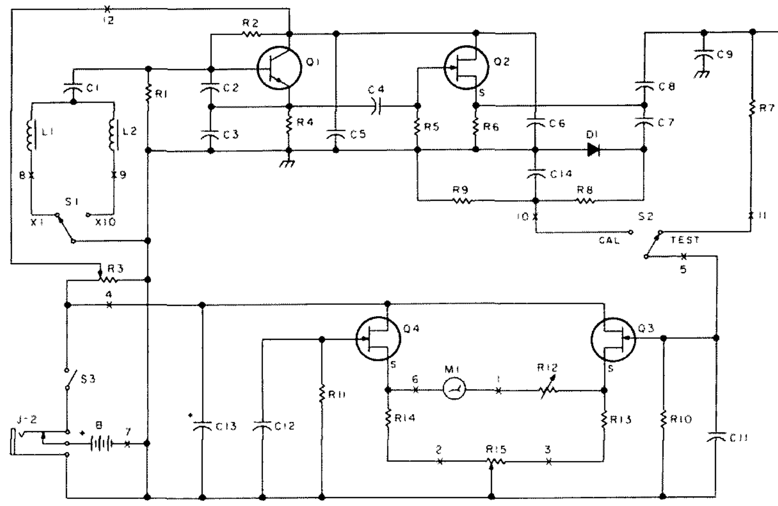


Fig. 1. Circuit schematic.

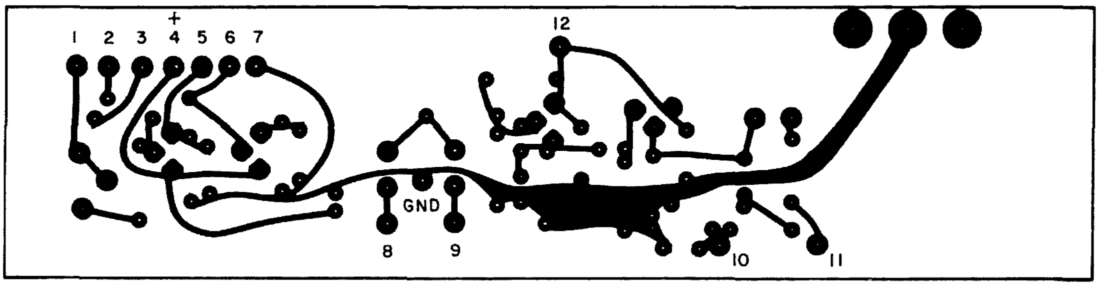


Fig. 2. Circuit board.

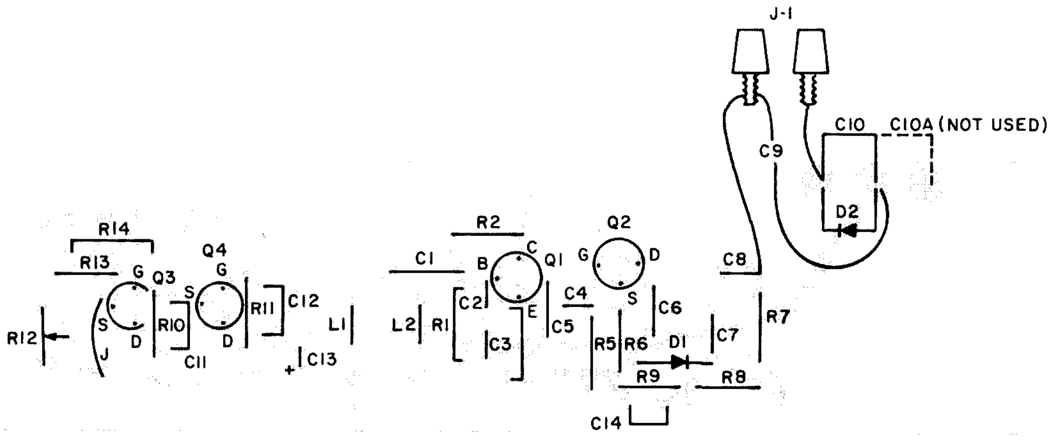


Fig. 3. Component layout, foil side view.

Parts List

C1	620-pF ceramic disc
C2, C3	68-pF NPO ceramic
C4	56-pF NPO ceramic
C5, C6, C11, C12	.01 ceramic disc
C7	100-pF ceramic
C8	22-pF NPO ceramic
C9	1500-pF poly
C10	138-pF variable (RS A1-234)
C13	10-uF, 25-V electrolytic
D1	1N270 germanium diode
D2	MBD-101 hot carrier diode
R1	47k, ¼-Watt carbon
R2	100k, ¼-Watt carbon
R3	10k linear pot
R4	1.5k, ¼-Watt carbon
R5, R9	1-meg, ¼-Watt carbon
R6	390-Ohm, ¼-Watt carbon
R7, R10, R11	2.2-meg, ¼-Watt carbon
R8	100k, ¼-Watt carbon
R12	100k trimmer
R13, R14	150-Ohm, ¼-Watt carbon
R15	2k linear standard pot
L1	1.97 uH (21 turns #24 enamel on T-37-2 toroid)
L2	19.7 uH (70 turns #32 enamel on T-37-2 toroid)
S1	SPDT rotary
S2	SPDT mini-toggle
S3	SPST mini-toggle
M1	200-uA meter (see text)
J1	Connectors for L_x (see text)
J2	Mini phone jack (normally-closed circuit)

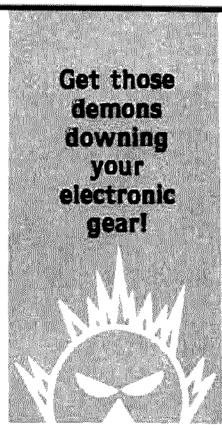
lengthened by attaching a one-quarter-inch round metal spacer with a bolt into the capacitor's threaded shaft. An alternative would be a small flexible coupler and a piece of ¼-inch shaft.

The total current drain is under 15 mA, so a 9-volt battery will last a long time with intermittent use. For ac operation, any rectified and filtered wall-plug supply that is rated at 4.5 to 9 volts fills the bill.

To put the Q-meter to work, set S2 to TEST, turn on the power switch, and adjust the meter to zero reading with R15. Switch S2 to CAL and set the rf level to 100 on the meter by adjusting R3. Connect the coil you want to measure, using the shortest possible leads. Reset S2 to TEST; tune C10 for maximum deflection of the meter. The reading is the approximate Q of the unknown inductor. If you cannot get any upward deflection of the meter, try the other position of S1. If you still cannot get a reading and you are quite sure the unknown inductance falls within the range of the meter, recheck the L_x connections. A good connection is a must for reliable operation of the Q-meter.

A test coil can be made by winding about 15 turns of #24 enamel-covered wire in a T-37-2 or T-37-6 toroid. You should measure it somewhere around 1 uH with a Q of about 100. If you are satisfied with the results, you may want to mark the measured information on a tag and attach it to the inductor. It can be used later to check the performance of the meter if you should question a reading on some unknown coil.

This relatively simple project can take a lot of the fear out of coil-winding, as well as sort out unmarked small inductors and provide the identification you need. ■



Nothing matches the MACC in voltage surge protection and component-by-component on-off control

- compact, attractive desk-top console
- eight clean AC power outlets
- individual and master on-off control
- superior three-stage auto-restore circuit with manual reset circuit breaker
- individually lighted rocker switches

Lightning striking miles away, electric motors running on the same power line, fluorescent lighting and even wind-driven snow static buildup can cause problems with delicate circuits and miniature electronic chips. But the MACC, within nanoseconds, can recognize the current disturbance, then clip it off and dissipate it, while maintaining clean current flow to your system's equipment. The MACC protects all semi-conductor, solid-state circuitry.

The MACC is designed with three 2000-amp surge discharge protection circuits — one between each of the AC input's hot, neutral and ground lines. Other surge devices may use a single 100-amp surge protector between the hot and neutral lines only. Its resettable circuit breaker adds further protection.

MACC gives you control convenience, too. It provides 8 plug-in "U" ground outlets for your components — including one "hot" outlet for a continuously powered application such as your clock. Seven "on/off" rocker switches let you control individual components. And you can turn your entire system on or off with a single master rocker switch.

ALPHA DELTA'S MASTER AC CONTROL CONSOLE PROTECTS AGAINST ALL THESE DAMAGING SURGE PROBLEMS

Problems caused in circuitry by surging and transient voltages:

- Melting of "hot spots" within semi-conductor devices
- Thermal runaway of transistors
- Welding, pitting and metal transfer on switch contacts
- Switch contact corrosion
- Insulation breakdown causing arcing of components
- Shortening of component life

The MACC is tested to IEEE pulse standards and rated at 15A, 125V-AC, 60 Hz, 1875 watts continuous duty total for the console. A label on the unit describes the surge protection limitations.

MACC Specs

Alpha Delta Master AC Control Console

Amperage	15
Volt (AC)	125
Hertz	60
Total Wattage	1875
Size	
MACC	11" x 2-3/4" x 2-3/4"
MACC-4	5-1/2" x 2-3/4" x 2-3/4"
Shipping Weight	4-1/2 lbs. approximately

Alpha Delta Model MACC Systems are designed to reduce the hazards of lightning-induced surges. These devices, however, will not prevent fire or damage caused by a direct stroke to an AC line or a structure. Specifications, availability and price are subject to change without notice.

Warranted against defects in materials or workmanship.

ALPHA DELTA COMMUNICATIONS, INC.

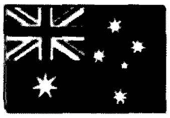
P.O. Box 571, Centerville, Ohio 45459 • (513) 435-4772

current solutions to current problems

73 INTERNATIONAL

Each month, 73 brings you ham radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Jack Burnett.*



AUSTRALIA

J. E. Joyce VK3YJ
44 Wren Street
Altona 3018
Australia

In most countries, to varying degrees, amateurs are involved in emergency situations. We in Australia have an organization called Wireless Institute Civil Emergency Network, abbreviated to WICEN, that is set up as a community service in times of declared emergency situations. It is used also at several sporting events during the year as practice exercise.

However, in what we in the southern states of Australia called "The Holocaust of Ash Wednesday," practice turned to reality. It was a firestorm that spread from Adelaide in South Australia right through Victoria and up north to New South Wales—a distance of 800 miles. For us it fell, unfortunately, on the biblical Ash Wednesday, February 16th.

The states of the lower part of Australia were ripe for a bushfire. Being realistic, bushfires are a natural phenomenon here, as a lot of our trees and grasses will not germinate until bushfires have heated the seedpods to temperatures that would destroy imported trees and shrubs. The previous two seasons had been hot and dry, and on the morning of the 16th, we had a temperature of over 40° C plus strong winds of over 60 mph at some spots.

We had noticed minor bushfire smoke on the horizon during the working day but were not aware that in a few hours the whole state of Victoria with all its emergency services—and amateur radio in particular—would be put to the greatest test for decades. As you can imagine, with a country that relies largely on telephone lines strung between gum trees and wooden poles across open plains, it did not take long, once the fires got started, to burn down the gum trees and the wooden poles, leaving much of the state of Victoria with a communications problem. Added to this was the fact that most of our emergency services had only two or three crystal-locked channels of communications each.

It soon became clear that WICEN had to be activated to back up the overloaded communications systems of the authorities. Most amateurs had been monitoring the 2-meter repeater in their area and it was not long before literally hundreds of amateurs had volunteered to go mobile or set up base stations in the affected areas. All the 2-meter repeaters were taken over for emergency use in the Melbourne area, giving us a coverage of at least 100 miles all around Melbourne. Also, we had HF set up on 80 and 40 meters for those low spots that VHF could not reach.

By the early hours of Thursday morning, February 17, WICEN was in full swing, had organized amateurs as base-receiving stations, and had dispatched mobile stations with VHF, UHF, and HF capabilities to all the disaster areas.

The sights at some of these spots were horrific, with some of the smaller towns losing 100% of their buildings. More than 2000 dwellings were totally destroyed. The loss of stock went into the thousands, and it was a pathetic sight to see hundreds of dead or dying stock, some of the badly injured ones still wandering around waiting to be shot.

Upon arriving at some of the places we were to operate from in the early stages of the operation, the scenes were not much better, with people wandering around dazed, some of them with their clothes still smoldering. Large holes burned in their coats, dresses, etc., showed how close they had come to being casualties. Even though a lot of them had lost everything they owned, their main worries were whether fathers or some other relations or friends had survived in the next town, or perhaps only 10 miles away.

With the fires still raging and the phones mostly out of operation, it was here that WICEN operators, by now located at all disaster relief centers, could really help. Welfare messages were passed, and the looks of relief on faces when messages came back that relations or friends were alright made a lasting impression on the WICEN operators, some of whom had spent up to two days with no sleep.

Some of the places of operation were a bit hairy, to say the least, as some amateurs decided to stay in the path of the fire to relay messages. While some were set up in plush hotels with cold drinks and hot meals, others were out in the bush with cold sandwiches and hot drinks.

As a rough guide to the intensity of the fires, agricultural pipes buried two feet underground were melted and buckled beyond recognition; land that was previously flat had actually boiled and afterwards was left rough and uneven.

The wind created by the fires reached over 100 mph in some places. One instance we had reported from one of the worst-hit areas along the southern coast of Victoria was that people trying to direct traffic had to wrap arms and legs around the safety rails of a bridge to keep from being blown off.

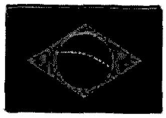
Another aspect of fires in Australia is that the same eucalyptus oil that gives relief to people all around the world is also released during the heat of the fires. It can form into fireballs that can be up to 50 feet across and can roll along, sometimes far in advance of the main fire front. There was a sad total of 70 lives lost in these fires over a period of 2 days.

The amateur involvement did not end with the fires. Amateurs later were asked to assist in "Operation Clean-Up," when councils from most country and city areas donated men and equipment to help the fire victims remove their debris so they could start to rebuild their houses and lives. As most of these bulldozers, front-end loaders, etc., did not have two-way communications, a control center was set up and approximately 150 amateurs gave their services either at control or out with the vehicles, directing them from one site of destruction to another.

A debriefing was held for all amateurs and some of the emergency services and the result, I feel, will be a greater degree of cooperation between all concerned in any future emergencies. Also, in the media coverage of the fires, there was a fair mention of the involvement of amateur radio, and I think the general public now has a greater understanding of the role that we, as amateurs, can play in community-service ventures.

The Wireless Institute of Australia has displayed proudly on the clubroom wall in Melbourne a plaque of appreciation awarded to them for the part played by amateur radio in "The Holocaust that was Ash Wednesday."

This photo, taken 100 years ago, shows the first electric plant in South America, in Campos City. Equipment came from Cleveland, Ohio, to Campos City, the pioneer in using electric light services in South America.



BRAZIL

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CW GROUPS

CW operation has had a gradual increase in Brazil the last five years, especially on the low bands. More on forty than on eighty, we can hear a dozen stations daily between 2100 and 0300 GMT, our after-dinner time. The establishment of more than twenty CW groups did this.

Sponsoring at least one beautiful award, CW groups have provided their members with the necessary incitement to be active in CW as much as possible. Their annual contests are successful and they receive more than 95% of the logs from the participants, even when they made only a few QSOs.

Since the beginning of "73 International," we have published, little by little, the rules of some of those CW awards. Now, after six months, we are happy to say that those groups which have had their award rules published have received many more applications for their awards from abroad. And the awards are not so easy, even for us!

AWARDS

Regarding the rules of the CWRJ Award published in our column of May, 1983, please add to the CWRJ members list the following stations: PY1QN, PY1PL, PY1DUB, PY1VKA, PY1VMV, PY1ECL, PY1DWM, PY1TBW, PY1APS, PY1DMX, PY1KX, PY1QQ, PY1URQ, PY1ENW, and PY1VEC. They are all very active stations and will make it easier to work the CWRJ Award.

LETTERS

We want to thank you very, very much for the letters we have received from readers of our monthly column. Besides the kindness and the most flattering terms of the letters, we are happy to know that readers are interested in Brazilian things and events.

One of them, Richard W. Randall K6ARE, collects old telegraph and wireless keys, and he is trying for one from each major part of the world. He wants an old key made in South America. The age does not make any difference, but it should be complete and in working condition. If possible, the key should be marked with the place it was made and the name of the company.

I have forwarded his letter to the CWSA CW group in the city of Santo Andre. Who can help Richard?

WIPA AWARD

Sponsored by the Grupo Praiano de CW (GPCW), the WIPA Award is available to all licensed amateurs for confirmed contacts with 10 (ten) different cities which have international ports (harbors) in at least three continents. No more than two cities for each country. For example: in Brazil, the city of Santos and the city of Rio de Janeiro. Contacts must have been made after January 1, 1983, on any amateur band. Only two-way CW mode with a minimum report of (RST) 338. No QSLs. Send GCR list of stations worked (call,

date, time, band, mode, and report) and 15 IRCs for mailing expenses to GPCW, PO Box 556, 11100 Santos, SP, Brazil.

Endorsements: copper label for additional 5 (five) cities, silver label for additional 15 (fifteen) cities, and gold label for additional 30 (thirty) cities.

de PY1APS

CAMPOS CITY AWARD

In 1883, a hundred years ago, using equipment coming from the Brush Electric Light Company, Cleveland, Ohio, for the first time in South America public electric light service was offered—in Campos, a Brazilian city in Rio de Janeiro State. Celebrating this event, Campos radio amateurs are sponsoring the Campos City Pioneer Award, as follows:

Available to all licensed radio amateurs, the award may be won by forming the sentence "1883-1983—Campos—Cem Anos de Iluminacao a Eletricidade. Pioneira na America do Sul (meaning 1883-1983—Campos—One Hundred Years of Electric Light Service. Pioneer in South America).

Use last letters of callsigns of stations reached to make the words. Contacts with two stations from Rio de Janeiro (PY1) are required, each one to substitute for one of the two dates (1883 and 1983). Contacts with stations from Campos City are valid as special QSLs to substitute for any missing letters.

Any band, any mode QSL is valid, mixed or single as well. Contacts made from January, 1983, on only. Do not send QSLs. Send log certified by amateur radio society or by two radio amateurs, stating name and call, date, QTR, report, band, and full address with zip code. Fee is 10 IRCs, and send request to Comissao Diploma Cent. Luz Elet., PO Box 391, 28100 Campos, Brazil, South America.

Submit the 62 needed QSLs in a column, in log, with the last suffix letters forming the sentence vertically.

PY2AMI BEACON PROJECT

Since April 14, 1982, a ten-Watt beacon has been permanently operating from Americana, in Sao Paulo State, at 28.300 kHz, using this message—VV VV DE PY2AMI PWR 10W ANT GP LAT 22 45 S LONG 47 16 W AMERICANA SAO PAULO. Congratulations and reports are coming from everywhere for this first 10-meter ORP beacon.

The PY2AMI call is the Brazilian hams' league, LABRE, in Americana. It was granted to the three Brazilian radio amateurs who were responsible for the transmitter and the CW identifying call message: PY2VRX Carlos Felipe, PY2FUZ Jose Roberto, and PY2CRI D'Orsay.

Reports have come from all Brazilian states, from as far as SM4KRT (Borlange, Sweden), LU9DDQ (Buenos Aires, Argentina), VE3MBN (Ontario, Canada), DF5FP (Amselwg, Germany), F3HQ (Eaubonne, France); from the USA: WB1DLE, Massachusetts, N8CSR, Virginia, and KA2LEB, New Jersey; from EA8EY (Canarias Islands), GD3FLH/P (Isle of Man), GM3MHG (Ayrshire, Scotland), ZL1ATW (New Zealand), PA3BKS (Netherlands), G5AQO (Romford, England), and many other places.

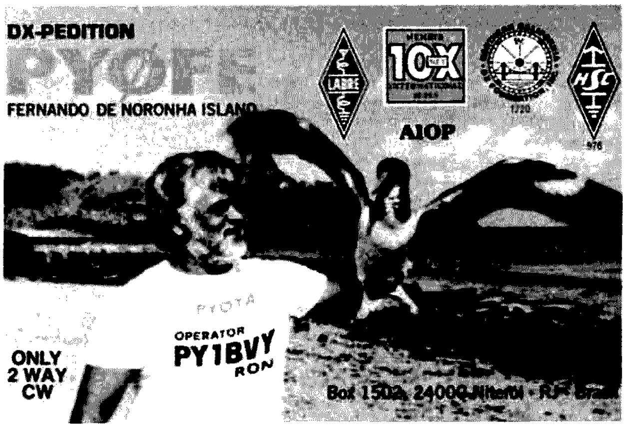
Keep an eye at 28.300 kHz and drop a QSL to PY2AMI Beacon Project, PO Box 31 or PO Box 108, 13470 Americana, Sao Paulo, Brazil, South America. Carlos Felipe, Jose Roberto, and D'Orsay will sure appreciate your report.

ORP IN BRAZIL

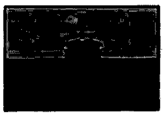
QRP operation in Brazil is getting a push, not only because of all the fun, not only because of new equipment and terrific prices, and not even because of its no-TVI advantages. QRP is growing as an immediate consequence of CW groups spread all over Brazilian territory, and even a QRP group was born from this, bringing to all radio amateurs (and especially to newcomers), love for CW operation. Easy-to-build transceivers and transmitters are a very strong call to the QRP world, especially in the CW mode.

What? Still talking about a no-code license? Why don't you think big? Why don't you try to be a "real" radio amateur and join all the fun?

de PY1CC



PY0FE's QSL. Ron is really fond of CW operations as you can see easily from the number of CW groups he's tied to.



ECUADOR

B. Patricio Recalde S. HC2PP
PO Box 511
Guayaquil
Ecuador

Last July 11, at 0728 hours, there was an aviation crash in which 119 people died. The location was four kilometers from the airport of Cuenca, the third largest city in Ecuador.

By 0745, the SAR (Servicio ala de Rescate), had an emergency net operating on 40 and 2 meters.

With the cooperation of radio amateurs, the SAR, part of the Air Force of Ecuador (FAE), was formed last year.

The area of the accident was easily covered by three repeaters, two from the Cuenca Radio Club and the other one from the Guayaquil Radio Club. The amateurs from Cuenca were at the place of the tragedy within minutes, and the reports were that there was nobody alive. At 0810, Guayaquil sent radio equipment and one amateur, by helicopter. At 0800, there were military people with amateurs from Cuenca covering the place. The repeater that was used was monitored by HC5KA, who was handling all the communication. He assigned different places for emergency handling, hospitals, Red Cross, fire department, police, and military.

At 0915 another helicopter was airborne to Cuenca from Guayaquil, and then, successively, three small planes were airborne to Cuenca. At this time, we all got to know that there were no survivors, and then our task got very sad.

We began, on 40 meters, to call relatives in different parts of the country and to locate people who were supposed to be in that plane but apparently were not.

There was a call through 20 meters to England to tell to some people there of an Englishman who died in the accident.

At midday, the emergency was under control. The SAR had handled the emergency in an extremely organized way. But 119 dead! We hope that this kind of accident doesn't happen again.

CANADA

(Reprinted from the CARF News Service Radio News*, No. 14/83, by permission of the Canadian Amateur Radio Federation, Inc.)*

According to reports from maritime amateurs, the DOC has taken action against a ring of illegal radio operators by seizing equipment and dismantling antennas in New Glasgow, Nova Scotia. Among the equipment seized was amateur gear modified to operate from 6 to 25 MHz. The group operates in and out of the amateur bands, with its own callsigns and QSL cards. Halifax amateurs reported that they were asked by the DOC to inform the Department of related "bootleg" activities. The enforcement action is being taken in cooperation with other countries. The DOC has not given out any details as the matter is still under investigation. Prosecutions will likely follow.

In what may be a spin-off from the recent sale of a Candu nuclear reactor to Rumania, Keith Jones VE3MH has received permission from that government to operate as VE3MH/YO in Bucharest. Keith, who works for External Affairs, was to have been on the 15-, 10-, and 20-meter bands since October 1st. The warm-up in diplomatic relations apparently resulted in this first such authority and also could account for two other firsts, both to Canadians—the issuing of a fishing license to one and permission to pursue his hobby of parachuting to another. It put Keith one up in the diplomatic community as even the US ambassador in Bucharest, who is an amateur, couldn't get the okay to operate there. Incidentally, Keith's good fortune is a one-shot special permission as there is no reciprocal operating arrangement between Canada and Rumania.

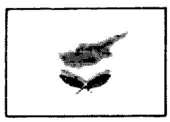
Scores of amateurs were present at the Royal Canadian Corps of Signals reunion and 80th anniversary ceremonies on Labor Day weekend in Kingston, Ontario. More than two thousand signallers, wives, and girlfriends participated in the three days of ceremonies, banquet, and barbeque. About a thousand veterans took part in the impressive march past, making a real good show considering it was forty or more years since they had left the Vimy Barracks training center.

Unfortunately, Canadian amateurs are spectators only in a situation which would affect them directly if the FCC proposal for a no-code license goes through. A militant group calling itself the "American CB Trucking Alliance" is pressuring US legislators for a far more permissive aproach to the code-free ticket than the one proposed by the FCC. The group wants all CB 11-meter operators eligible for amateur status in any new codeless license class. Most of this crew are operating illegally. US amateur organizations are meeting the FCC head-on in this one, with the perennial champion of the American amateur, Senator Barry Goldwater, leading the charge, with the assistance of other legislators.

Thanks to the assistance of the Minister of Communications, Francis Fox, three CARF handbooks are being translated into French, to be published by CARF in 1984. *The Regulations Handbook* is in the process of translation now.

Hopes may not be realized to have the ARRL DXCC list graced with a special prefix for St. Paul and Sable Islands, as they are based on the assumption that they are not under any provincial jurisdiction. They are, however, very much a part of Nova Scotia's territory, according to the federal Privy Council Office.

Regional Notes: Midwest—Norm Waltho VE5AE has taken over the VE5 QSL Bureau in addition to his other activities, including the "CARF Family Hour" on 3770 kHz at 0215 Zulu. Atlantic—Leigh Hawkes VE1ZN will be starting a CARF Regional Net soon. Ontario—Craig Howie VE3HWN, who has been very active in CARF, has resigned his directorship as he has moved to Calgary with a new job.



CYPRUS

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Limassol
Cyprus

NEWS FROM CYPRUS

On the 3rd and 4th of September, we had the National Field Day Contest. In this contest, three club stations took part: the Nicosia Club 5B4NC, the Larnaca Club 5B4LC, and the Paphos Technical School Club 5B4KX. Many amateurs helped in the setting up and operating of the stations, which shows that interest in amateur radio in Cyprus is growing.

All stations have sent me a report on their operations, and I start first with the Nicosia report which was sent to me by OM 5B4IT.

A few days before the start of Field Day, an initial scouting by 5B4IT and John 5B4MC around the capital, Nicosia, resulted in finding a nice hill called Kambia. Early in the morning of Field Day, 5B4NM (Marios), 5B4MB (YL Marianna), 5B4LP (Andreas), and 5B4MF (Spyros) went to the site and installed dipoles for 10m, 15m, 20m, and 40m. They also put up a 4-band vertical antenna. Around noon,

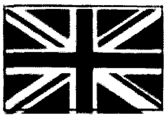
5B4MC and 5B4IT arrived with the rest of the gear, including a Sommerkamp FT-277 and a gasoline generator. Then the antennas were tuned and all was ready for the afternoon. All sat in the shade (temperature 35° C) and had a beer and a snack. 5B4MD (George) arrived in the afternoon bringing the last supplies of food and an IC-720 transceiver.

At 1800 hours, the contest started with MF first to operate. Around 2000, the fire for the barbecue was started, but the transceiver never stopped operating. At about 2330, 5B4BD (Antonis) became quite hungry and so the charcoal fire was started again. Nobody slept that night until very early in the morning when one by one, each in turn had a short nap. Breakfast was served by 5B4MD. During the contest propagation was poor, and a final total of 937 contacts was made. Everybody in the group enjoyed both the barbecue and the contest, but it is rather difficult to decide in which order.

The Larnaca Club activities were reported to me by the main leader of the group, 5B4GJ (Erricos). The installation of the tent and generator was done by 5B4EA, 5B4GJ, and their harmonics. The site was 3½ miles outside Larnaca City, by the seaside. Dipoles for 10m, 15m, 20m, and 40m were installed by 5B4DM and 5B4SP. Main operators for the contest were 5B4DM, 5B4JW, and 5B4SP. At the site, also present and helpful with operation, were 5B4EN, 5B4KY, 5B4FM, and 5B4AH, who repaired the transceiver which was used. Only 160 contacts were made due to poor propagation, and also the station was operated only until midnight Saturday and during the early morning on Sunday. According to Cyprus tradition, everybody enjoyed lots of food and drinks, such as wine, ouzo, beer, and whiskey.

The Paphos group reported to me via 2m that they set up their tent and station a few miles outside Paphos, by the seaside. The station was operated by 5B4JR (Andreas), 5B4JX (Sotos), 5B4MG (Dimitris), 5B4AI (Paul), who is also J28AI, and a group of pupils of the Paphos Technical School club station, 5B4KX. The Paphos group reports that they made around 450 contacts. So the Nicosia Club is the winner for this year's contest.

The Limassol group hopes to take part in the contest next year, and we generally hope that more Cyprus amateurs will be taking part in contests—not only local ones but also international ones.



GREAT BRITAIN

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THE UK SCENE

I have mentioned before the problems of intrusion on the amateur bands by illegal operators. This has usually meant CBers moving up from the crowded 27-MHz band into the bottom of our exclusive 10m band. Recently a new menace has presented itself in the form of cordless telephones.

The UK has for many years had a very restricted and tightly-controlled state monopoly of telecommunications run by British Telecom (formerly The Post Office). BT's obsession with technical excellence and paperwork has long frustrated attempts to introduce modern telecommunications facilities (such as keyphones, call-distribution systems, mobile phones, electronic exchanges, and so on) for business and domestic use.

It is fair to say that BT has heeded the Thatcher government's desire for liberalization and competition with a more aggressive and commercial approach to its marketing. However, commercial pressures have led in the last couple of years to the widespread use of illegal telephone equipment.

Included in this category is the cordless telephone of the type consisting of a base station and remote hand-held or mobile unit. To provide full duplex communication, these crystal-controlled units operate on widely-separated transmit-receive frequencies. Most of the imported units are 1.6-2 MHz and 49.7-49.9 MHz, or 49.6-49.9 MHz and 70-70.5 MHz.

This causes interference to two amateur bands in the UK since, in addition to the International top-band allocation on 160m, we have an allocation at 4 meters (70 MHz).

With an estimated 10,000 illegal units operating in London alone and using powers up to 100-mW FM, the scale of likely interference is readily appreciated. A recent report compiled for the Radio Society of Great Britain by G3TCT has brought a measure of the problem to the attention of BT's Radio Interference Service. (Recent legislation provides for legal operation of cordless phones on 1.632-1.792 MHz and 47.45-47.554 MHz.)

DECLINE OF UK CB?

As predicted by a number of pundits, the growth in the UK CB market has not continued. CB has not and is not likely to replace hi-fi or video as the dominant consumer electronics market.

A recent statement in the House of Commons by Alexander Fletcher, Secretary of State for Trade and Industry, pointed out that although 453,000 CB licenses were issued since legalization in November, 1981, only some 285,000 are still valid. The general impression one gets from the scale (or lack) of CB advertising and the demise of most of the street-corner equipment shops suggests that UK CB is no longer significant.

NOVICE LICENSE?

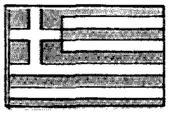
The government has again rejected suggestions that a Novice amateur license be introduced to allow code-free, minimum-technical-knowledge access to the amateur bands. It is felt that nothing should be done which would reduce the high standard of operating and technical proficiency shown to date by the Amateur Service. I doubt that few readers will disagree with that.

* * * * *

The RSGB breaks some new ground with the election of Bob Barrett as its president for 1984. As well as being Welsh and only in his early forties, Bob holds a class-B VHF-only callsign (GW8HEZ). Bob is the first class-B license holder to be elected for this high office.

Anyone contemplating a visit to the UK, or just interested in the latest happenings over here, might like to call the RSGB Headline News Service for some recorded comment. The number to call is 44 707 59312.

On the subject of telephone numbers, reference orbits (and other information) for UoSAT (OSCAR 9) can be heard on 44 483 61202.



GREECE

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In my previous column, I mentioned the new frequencies now in use by Greek amateurs.

By the time you read this, you probably will have heard some of them working around the new bands. On 160 meters, you may find Charlie SV0AA (ex SV0WT). Charlie is an old-timer coming from the States but living permanently in Greece—for about 20 years now. He is well known among CW operators worldwide and he is really enjoying 160 fun with his brand new Corsair from Ten-Tec and a center-loaded vertical. Of course, Charlie is not the only one down there, but he is probably the only one on CW. (If I find a solution to the antenna problem, I will certainly join him.)

There are also some SVs on 30 meters and there will be more as soon as interest grows.

Starting cars being flagged off at the Parc Ferme. The ham operators are stationed right under the banner in the background.

Finally, for you OSCAR enthusiasts, SV1OE and SV1AB are almost daily in AMSAT's new bird, offering both SSB and CW to the satellite DX chasers.

By the way, if anyone has a problem getting a QSL out of my fellow SV amateurs (including me) or needs a sked on some particular band/mode, I will be more than happy to help.

September and October are contest months, so as I write this many Greek radio amateurs are ready for the big events during these months. In a contest, not only can you upgrade your operating skill and represent your country, but also you can pick up some new ones, and this makes the effort very well rewarded.

So, antennas have been tested and tuned for optimum performance, radios have been checked, and arrangements have been made for the XYL and kids to spend a pleasant weekend at her sister's (or mother's) place away from the shack jungle where the cannibals will scream and yell at the microphone for 48 hours!

INDIA

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HIMALAYAN CAR RALLY

Photos by C. P. Ravindranath

The third Himalayan Car Rally was one of the toughest rallies in the world and therefore was indeed a challenge for the motorists. So was it also for the hams who provided communications for the organizers. They travelled over the most difficult tracks of the rally, along spine-chilling but beautiful mountain roads high up in the Himalayas.

Thirty radio amateurs from different parts of the country converged in New Delhi to take part in this hectic activity from 30th October to 6th November, 1982. While seven were stationed at the Communications Headquarters and six were mobiling on different legs of the rally, 17 were manning nine different base stations along the 4000-km track.

Communications Headquarters was located adjacent to the headquarters of the organizers in the Hotel Maurya Sheraton, New Delhi. It was manned by VU9AID Dasan, VU9BBJ Asu, VU9NKR Naresh, VU9RX Vasani, VU9TN Ram, VU9UK Kap, and VU9YY Rayu in three shifts, with the special call VU9HRY. Changing shifts every four hours, the station was operative on 80m, 40m, 20m, and 2m all the time. Three separate dipoles for the HF bands and a 12-element yagi for VHF, all on top of the 40-meter-high hotel roof, were powered by a TS-830S, Drake TR-7, Icom 720, and a host of VHF rigs.

VU9AIR Viji, VU9FD Dinesh, VU9HSL Homi, VU9KIT Chris, VU9NA Sasi, and VU9PCD Pradeep were manning the mobile stations en route. All of them, except VU9AIR Viji, started from Bombay and came to New Delhi where they branched off in different directions. All of them were operating throughout the rally, providing most valuable support. In fact, the most adventurous, daring, and back-breaking activity of all was that of the mobiling hams.

The base stations were located at Dehradun and Mussorie (VU9LT Ratna, VU9LR Satya, VU9BF Kalia), Nainital

(VU9SU Subi, VU9WC Sesha), Ranikhet (VU9KT Dilip, VU9VPR Vilas), Narkhanda (VU9VMJ Jadeja, VU9VRG Gopal), Manali (VU9MMA Mathew, myself), Simla (VU9SNM Subhandu, VU9XX Patil), Mandi (VU9SRJ Ramu, VU9POP Prakash), and Rai (VU9GSI Gurudev, VU9JSI Jasvinder), all along the route of the rally.

Originally, one more station was planned at Khoksar (10,000-foot altitude), but we had to cancel it since the rally itself went only up to Marhi, a little beyond Manali, due to snow-clad roads.

Most of the base stations were on HF bands. However, some operated both (Manali, Simla) and one VHF only (Narkhanda). The setup at each of the stations was decided on the basis of the survey done earlier by VU9RX Vasant.

VU9MMA and I were assigned to Manali, which was the northern tip of the rally route. At Manali the rally stopped for a night and returned from Marhi during the next day. So Manali was considered an important regrouping control point.

We were staying at the Hotel Beas, named after the snowy river flowing by its side. We had a trap dipole for 80m, 40m, and 20m supplied by VU9RX Vasant, which we put across the river (150 feet wide) at a height of about 80 feet above the water level. The other 40m and 20m combination inverted V, which I had brought along, was put up at the Parc Ferme (where the vehicles were parked for the halt), about 200 meters away from the hotel. The 3-piece, 12-element 2m ZL beam was moved around quite a bit whenever we needed it.

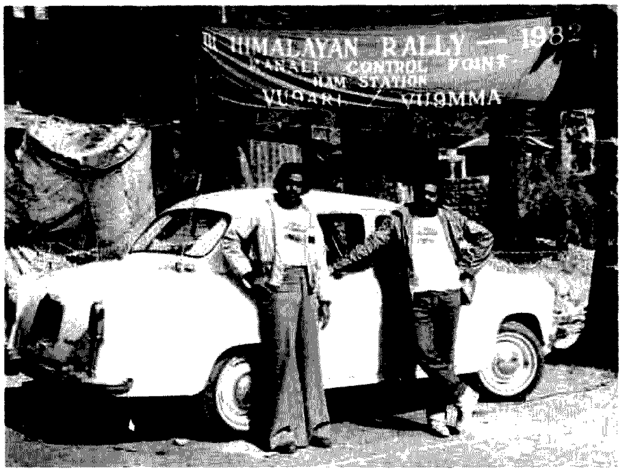
In spite of Manali being a very important control point, we had only one HF rig (Kenwood TS-130S) and one VHF rig (Icom IC-255A) to work with. Both of these were worked on an 80-Ah car battery which was under charge all the time.

The propagation conditions changed so rapidly that we had to keep on changing bands, one after the other, almost every hour. And very often, we had to get the assistance of hams in southern India to relay traffic. But generally 20m stayed good for the day and the other two bands were good during the night. Copy from Marhi on 2m was perfect throughout.

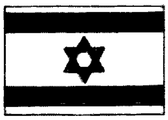
Until the cars started coming in on the night of November 3rd, we were operating from indoors, either relaying for some other rally station or handling traffic for the local regrouping control officials. But we had to stay outdoors almost the entire night once the cars came. And outside, it was really cold at 2° C. For many that may not seem cold, but for us who came in from far south, where the temperature varies only between 26° and 35° C, it was really very, *very* cold. There were many occasions while operating outdoors when we had to stop talking to breathe!

On our way back to New Delhi on November 5th, we also picked up VU9SRJ Ramu and VU9POP Prakash from Mandi, whom we had dropped there on our onward journey. In the prize-distribution ceremony (and later at the Rally Ball), to which all the participating hams were specially invited, the organizers commented on the excellent backup we all had provided for the rally. In fact, in their words, "We only organized the rally; the hams ran it!"

The whole communications network organized by the Federation of Amateur Radio Societies of India (FARSI) was steered by a committee headed by VU9AID (Chief Coordinator) and ably assisted by VU9RX Vasant and VU9TN Ram. In spite of all the difficulties with climate, food, and travel, all of us really enjoyed this activity and are looking forward to something similar again.



VU9MMA Mathew and VU9ARL James standing outdoors where they set up the station



ISRAEL

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In the last edition of this column, I reported on the Israeli VHF scene and mentioned Bruno 4X4DH's pioneering work with the first OSCAR satellites.

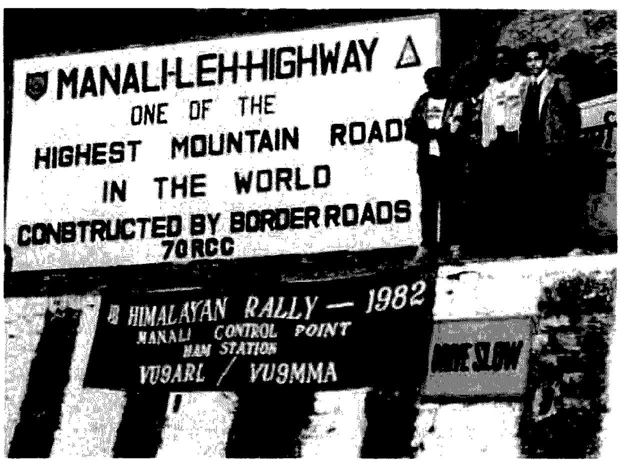
It is with pleasure that I can write that with the successful launching and operation of AMSAT OSCAR 10, Aharon 4Z4AG, Bruno's student from the Tel Aviv Club 4X4HQ in the class of 1966, was following in his footsteps on that historic afternoon of August 6th when the satellite's transponder was turned on. The other Israeli station making contacts through the bird was that of Abe 4X4IX.

Aharon, well known in ham circles here for his high degree of technical proficiency, had his Mode B station already standby on the day of the launch. His gear is largely home brew—the receiving converter, transmitting amplifier, and antennas. The 70-centimeter transmitter is a Kenwood TR-9500; for receiving he uses a crossed yagi, and he transmits on a helical antenna. Aharon wants to add a low-noise amplifier to his receiving setup to aid the weak signals. His elevational antenna rotator is also home constructed.

At the date of writing, 4Z4AG had contacted 30 countries through OSCAR 10, reporting that its apparent range from Israel is from New Zealand in the east to California in the west. California was contacted using at the time only ten Watts of CW, and the station sent him Hebrew New Year's greetings, to Aharon's great surprise! Aharon thinks that contacts with Hawaii may be possible, but only when the satellite is in a very particular position.

The amateur radio study guide, from the Open University's Center for Technological Education, mentioned here a few columns back, has at long last been published and been made available to the public. The book made its debut in August at the joint pavillion of the Israel Amateur Radio Club and the Center for Technological Education at "Youth City" in the Tel Aviv fairgrounds.

Along with a display of the CTE's educational wares—various courses and books in the technological fields—special-events station 4X4CET was operated around the clock. Interested visitors were given explanations and encouraged to sign up for the next courses to be given at 4X4HQ. Special mention must be made of Naomi 4X6DW for her efforts in setting up the station and coercing people to operate it!



VU9MMA Mathew, VU9ARL James, and their friends just outside the hotel on the bank of River Beas.

So, after two thousand years, the first ham study book has been published in the Hebrew language. Although this well-put-together and attractive work is intended only for the grade-C Novice ticket, it is so thorough that it gives a good background for the higher-class grade-B license. The Center, so it is said, has at present no intention of putting out a higher level course. Instead, they are making available a bibliography of their other books which cover the technical topics of the grade-B exam, such that the reader of the Hebrew language will not be left high and dry when he wishes to upgrade.

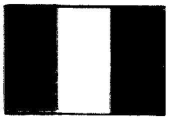
The IARC Events Committee has been busy making plans, including, in May, a world conference of radio amateurs to be centered around the Israel Independence Day celebrations. Arrangements are to be made with various travel agencies and the Ministry of Communications. When more details are available, they shall be rushed to *73*. In February, there is to be a national hamfest which will include the raffle of equipment and "junk" that was missing at the Annual Assembly. National Field Day is planned for the spring, March 20, 1984.

A new committee has come into being—the Contest Committee. Meeting at the QTH of Mike 4X6DF, they set for themselves the following aims: the creation of an Israeli worldwide contest, updating the rules of the Spring Contest (mentioned in the September, 1983, issue), liaison with the Ministry of Communications and foreign magazines, and the formation of a big guns all-star contest team to operate in the multi-multi class. Good luck in the contest!

On the social front, there have been meetings of both the Old-Timers, with Ozzie 4X4CW at the helm, and the Young-Timers, with Rami 4X6FH coordinating get-togethers. The Jerusalem Club, meeting on the first Thursday evening of each month, extends its invitation to all visiting amateurs. The profusion of visitors from abroad was so great at a previous meeting that the proceedings were conducted in English, under the capable leadership of Ben 4Z4ZA!

I have both good news and bad news for the seekers of the coveted Jerusalem Award. First the good news: Only 8 IRCs will be required instead of 10. Secondly, 4X4JW has informed me of the following changes: Seven contacts with Jerusalem shall be needed instead of five, and three additional contacts must be made with other Israeli stations. QSLs go to 4X6AA (Dr. Milt Gordon, PO Box 4079, Jerusalem, Israel).

To help you out with this difficult award, active Jerusalem amateurs include 4X4s JW, LH, LI, RL, SO, and WP; 4Z4s JS, SM, SW, US, ZA, and ZB; 4X6s AA, BM, CJ, CQ, and GH; G3ZCZ and WB6SZB, both portable 4X. There are probably others, but these are known to me as active on HF. Check out the high end of 20 meters SSB after 2100 GMT.



ITALY

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Nicola Sanna I0SNY, breaks his own world record from Ceuta, EA9, to Italy:

Continued on page 134

On the Move with 10 FM!

These modifications for Comtronix and Azden rigs will get you on your feet in a hurry.

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Andy and his rig.

What aspect of modern ham radio could cause a 75-year-old "recycled teenager" to tumble back into a medium which devoured his spare time as far back as 1928? The excitement and freshness of FM on ten meters did it, coupled with the fact that you can carry by shoulder strap a totally portable station feeding 14 Watts rf into a 7.9-foot whip.

Owners of transceivers like the Comtronix FM-80 and Azden may benefit from my tinkering—which included adding a 2.5-mH rf choke where the hot mike lead enters the chassis, to kill audio squeal from rf entering the transceiver through the mike cord.

Discarding the whip which came with the Radio Shack CB kit (No. 21-941A), the ceramic cone and sturdy aluminum bracket gave me the necessary and secure antenna support. My FM-80 had two knurled screws on each side of the clamshell case, intended for U-bracket mounting under the dash. I used these screws and holes to fasten two suitably shaped 1/8-inch-thick dural plates to which not only the whip-mounting bracket could be fastened, but also the studs holding each end of

Close-up of the rig.

the Superscope tape-deck shoulder strap. In this way, no drilling of the clamshell was necessary except for the minibox mounting.

I experimented through a succession of whips to settle on a unit 7.9 feet long, consisting of a bottom section of 31 inches of 3/16" flexible aluminum rod, the upper end of which was threaded to fit an appropriate hole in the base of an 8-section telescoping whip, available for $.99 from Etco Electronics in Plattsburgh, New York. (Get on their mailing list; you'll not regret it!) This makes an extremely light, portable whip.

The heavy aluminum right-angle bracket (part of the ceramic cone insulator) was painstakingly rasped into shape and made to swivel through a short arc from a central hole with 10-32 thread screws into the dural plate. This allowed the whip to be vertical whether the FM-80 was shoulder-carried or operated from a card table outdoors.

A Bud CU-2102-B minibox was secured to the clamshell with 4-40 tapping and screws to hold the transmatch network—same as Ten-Tec's 247 unit. I settled for ten turns of No. 22 enamel on a 1/4-inch bakelite rod. The 100-pF (each section) 2-gang capacitor may be hard to come by, although Etco has one with 45 pF per section that will work (No. 151JK, made in England). I am actually using only about 40 pF each section for an excellent 1.1:1 swr into the whip.

I dismantled several Meissner mica compression padders to come up with one 100-pF capacity feeding the whip. It was a most pleasant surprise to find that the Radio Shack Micronta 3-way CB tester (No. 21-526A) of 10-Watt rating would handle our 14 Watts (up against the pin) with no sweat. Unfortunately, the coax fittings extended out the top surface. Identical holes were drilled and reamed out the bottom; fortunately, the PC board inside could be tipped so that its coax outlets were convenient for my use.

An swr reading should always be available while walking with this rig. Two access grommet holes in the minibox permit one to make corrections for minimum swr before starting out. Hold the mike to your face in the same attitude and the swr will remain low. When the rf power meter on the FM-80 falls to mid-scale in transmit, the nicads should not be discharged further; the receiver itself should be turned off. These batteries should never be totally discharged.

I have not regretted using the BP20A-11 nicad battery pack of 2.3-Ah capacity

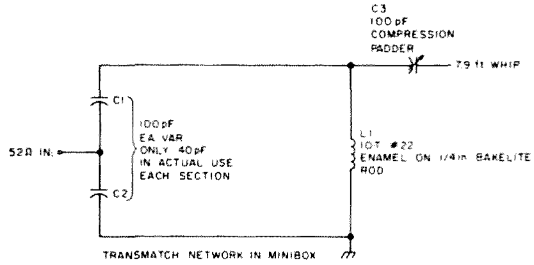
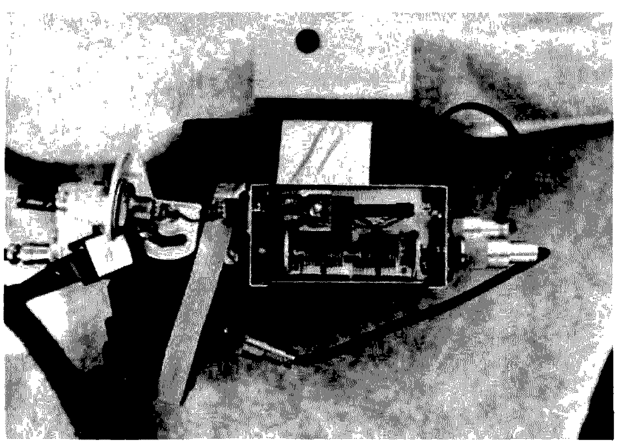


Fig. 1. Transmatch network in the minibox.

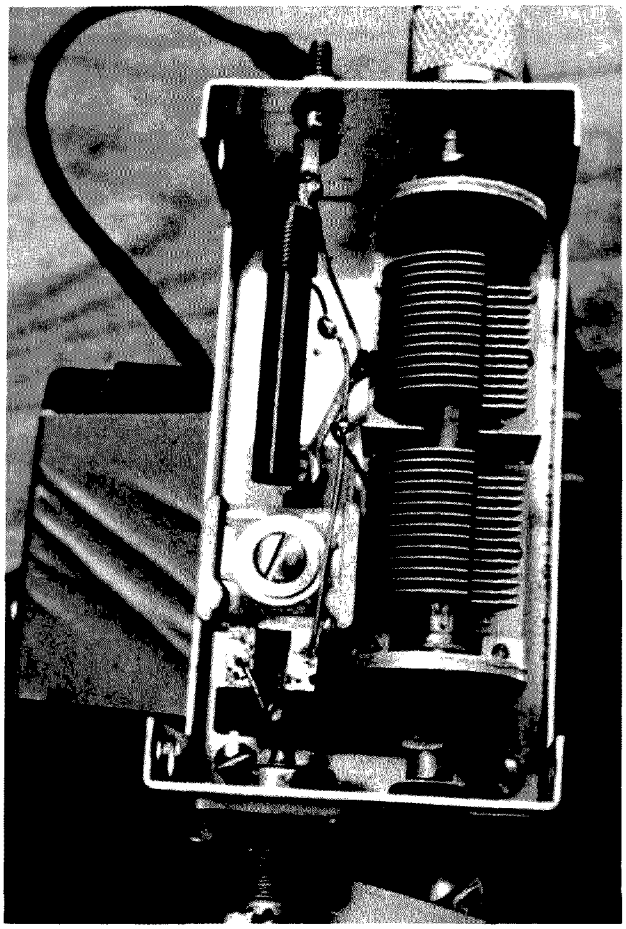
(from Alexander Mfg. Co. in Mason City, Iowa) and their 20-11 charger is guaranteed not to overcharge this unit. Fully charged in 10 hours, its 14 volts provides about three hours of operating fun. Silver duct tape secures the battery pack and swr meter case to the clamshell.

In passing, Azden/Comtronix-type transceivers intended for portable use will eventually have to go to LCD frequency/channel readouts since LEDs in daylight are useless.

While testing this unit in my basement workshop several feet below ground level, the whip lying horizontally, N4JB in Germantown, North Carolina, couldn't believe the circumstances for the boffo signal he copied! Operating it on a card table outdoors feeding a Cushcraft Ringo-10 right from the swr meter, the world is your oyster. See you on ten FM! ■



The modification of the antenna-mounting bracket.



The transmatch innards in the minibox.

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Canada B3L 4J4

Thank You for Listening

Build this simple speech expander and stop shouting. Your DX friends will thank you and the QSLs will roll in.

A versatile little chip called an electronic attenuator and manufactured under the brand code MC3340P is the heart of this unit. When used ahead of my old war-horse—the Heathkit SB-401 transmitter—it certainly adds a few S units when trying to make a QSO through the QRM.

In Fig. 1, the MC3340 is shown being used as a basic remote volume control. The advantage of this circuit is that the remotely located potentiometer does not need cumbersome shielded leads directly connected to a sensitive mike or other low-level audio input. When pin 2 is held high (up to +6 V dc), the audio will be fully expanded—approximately 0-dB attenuation. If the voltage at pin 2 is brought down to 3.0 V dc, 90-dB attenuation is achieved. The control potentiometer, when varied between 4k and 30k, theoretically achieves the 0-dB-to-90-dB attenuation.

Based upon these premises, the speech expander/clipper came into being.

The input transistor, Q1, is a 2N3819 and, being an FET, serves as an excellent high-impedance buffer for the microphone and the MC3340. Transistor Q2 is a 2N1305 or similar transistor having a fairly good low-leakage coefficient. This transistor serves the purpose of dynamically varying the dc voltage at pin 2 of the MC3340.

The second chip, IC2, is a dual op amp, i.e., an LM358. Half the LM358 is used as an ac complex-non-inverting amplifier. The other half could be used to drive a VU meter or bar-graph display which can be used to monitor the audio output. However, the first half of the LM358 samples, through its pin 3, a portion of the audio output from pin 7 of the MC3340. Based upon the setting of R3, which controls the gain of the LM358, the sampled portion of the audio signal triggers a control voltage to appear at pin 1 of the LM358. This control voltage is rectified by D1 and fed to the base of Q2 which in turn controls the gain of the MC3340. Thus, the whole circuit acts as a sort of agc loop with R2 and R3 setting the attenuation thresholds.

Most of the parts are readily available at your local Radio Shack, except for the MC3340 and possibly the LM358, for which they may have no equivalent. Any op amp could be used for IC2—the only stipulation being that it must be able to work off a single-rail supply. The prototype unit that I built used an LM741, but it required two 9-V batteries to produce the dual-rail supply. I suppose the CA3140, which is said to have a better slew rate than the 741, could have been used with a single-rail supply. However, as far as I know, the MC3340 has no equivalent. Therefore, this IC will have to be obtained from a Motorola dealer.

The printed circuit board is fairly easy to lay out and etch and should be no problem to the regular constructor. In the Heathkit SB-401, the unit can be built inboard if the VU meter/bar-graph display is not included. The unit is more accessible with plenty of scope for expansion if built as an outboard addition, in which case the male and female replicas of the microphone connectors must be obtained.

Setting up the attenuation thresholds can be done accurately and quickly if a scope is available. If a scope is not available, plug the microphone into the input socket and clamp the leads of a pair of headphones between output connector and ground. (Do not plug the output of the unit into the transmitter.) Turn on the crystal calibrator of your receiver and adjust the audio output of the receiver for a high-pitch audio note. If the scope is available, connect it to the output connector of the unit.

Place S1 in the BYPASS position. Set R2 for minimum resistance from ground. Set R3 to minimum resistance. Set R1 to the halfway mark. Place the microphone near the receiver's speaker. If S1 has been connected appropriately, a weak tone should be heard in the headphones and a low audio trace should appear on the scope.

Now apply power to the unit and set S1 to OPERATE. If all has been connected well, you should get a significant increase in audio level at the output. Check the voltage at TP1 with a high-impedance voltmeter, preferably digital. It should

read 2.6 V dc. The voltage at TP3 should be zero or −Ve. This is the unit in full expansion mode.

Increase R3 until the voltage at TP3 goes positive approximately 1 volt. Check the voltage at TP1. It still should be showing +2.6 V dc and the scope should still be showing a healthy trace. A quick flip of S1 from OPERATE to BYPASS and back to OPERATE should show the amount of expansion.

With the voltage probe still at TP1, increase R2 until the meter shows +3 V dc. Now increase R3 until the meter reads +3.6 V dc. A reduction in the audio level at the output will be noticed and the trace on the scope will alter likewise. This is the clipping point.

If the audio source is abruptly increased and held at that level, or a loud long shout is emitted into the microphone, the result will be a sharp rise followed by a steep decline of the output signal to a constant level. This is most noticeable on the scope. The voltage at TP1 should show +4.5 V dc or higher (max. +5.2 V dc). This status is the unit in the attenuation mode.

When this has been achieved, speak at your normal level into the microphone and adjust R2 and R3 alternately until an accentuation of your voice from your normal speech level shows the peak briefly appearing and then being pulled down to the normal level. The aim of the adjustment procedure is to get that time constant between the peak and the pull-down as short as possible.

When this has been achieved, disconnect the headphones, turn off the crystal calibrator or audio source, plug the unit into the transmitter, and tune the transmitter into a dummy load. It will be found that the microphone gain control does not have to be turned up so much before the ALC cuts in. If a scope is used to monitor the transmitted audio signal, check and fine-tune R2 and R3 to suit your voice pattern and distortion threshold.

Get on the air and see how it works. Contact a distant station with the unit in OPERATE mode. Do not mention the unit, but in the course of conversation put it into BYPASS and wait for the reaction. Act accordingly.

I will be pleased to receive comments, enhancements, modifications, etc., concerning the unit and its operation.

In closing, I would like to thank G3YNB (H. Clayton) and VE1AOP (G. Coughlan) for getting me into redesigning the unit and writing this article. ■

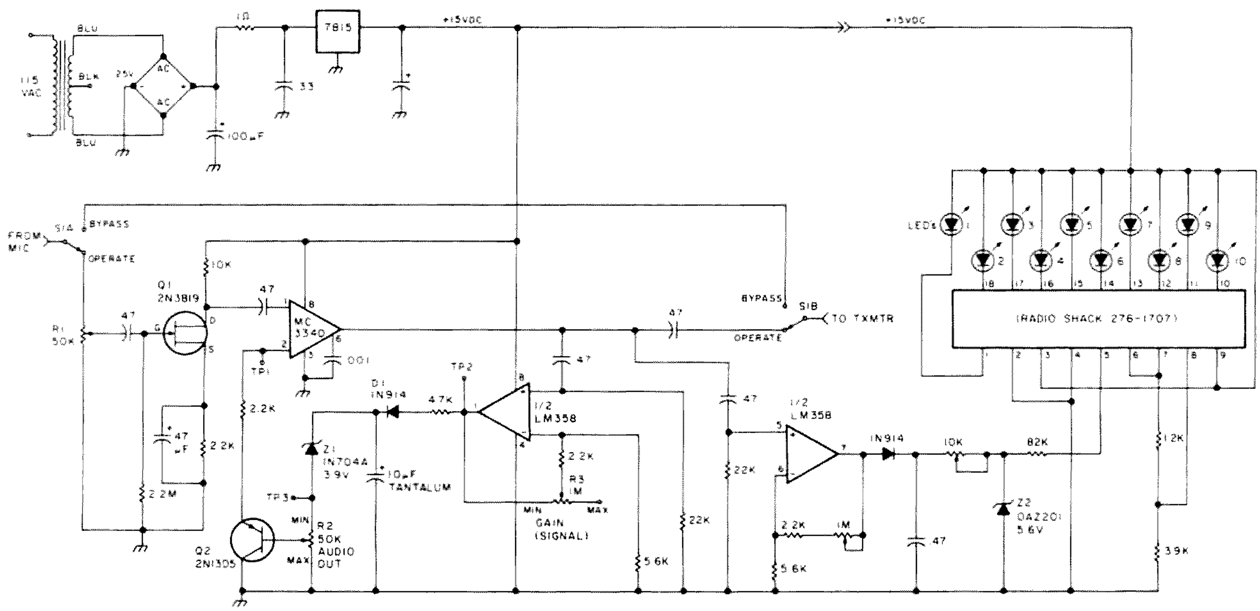


Fig. 1. Speech expander/clipper with LED bar-dot display.

Harry J. Ekelund WB2FYW
42 Pocantico Road
Ossining NY 10562

Secrets of Nicads

Nicad batteries will save you money. Or will they?

You've been reading for years that nickel-cadmium batteries are the greatest thing since sliced bread for your portable gear. From one viewpoint, this is true, namely, economy. One set of nicads can be recharged many times before they have to be replaced, at a savings to the user every time they are recharged. However, there are some down sides to the use of nicads, some of which are readily apparent (lower terminal voltage, memory, downtime while charging) as well as one which is very important but not widely known: The capacity of a nicad is only about 25% that of a premium primary cell.

As an example, let's take the AA-size cell. The commonly available AA nicad has a capacity of 450–475 milliampere hours (mAh). Gould, GE, and Radio Shack cells fall into this range. A premium alkaline AA cell from Duracell, Eveready, or Ray-O-Vac has a capacity of 1700-1900 mAh or nearly four times the capacity of the nicad. Thus, it would be necessary to recharge the nicad cell four times before you achieve any economy.

But wait. There is more to this story. We all know about the memory associated with nicads. If not fully discharged before recharging, they have a tendency to "remember" the discharge cycle, limiting the life to the remembered discharge. Suppose you use your HT every day to and from work for a total drain of say, 150 mAh. You decide to put the charger on every night so as to have a full charge, right? *Wrong*. Unless you drag those batteries right down to nothing, a constant discharge/recharge of 150 mAh will result in cells with a capacity of about 150 mAh. Thus, you would have to recharge 12 times to obtain the same life as a set of premium AA cells. But that still represents some economy, doesn't it? Sure, if you are satisfied with less return on your investment than you expected.

Let's talk about the lower terminal voltage of nicads. They are 1.2 volts when fully charged. Eight cells (typical arrangement) will give you only a 9.6-volt power supply, vs. 12 volts from eight fresh premium alkaline cells. Some HTs will provide space for 10 cells when using nicads, and some dummy cells to be used with primary batteries, but then your economy is eroded further (10 nicads vs. 8 alkalines).

Now, your 12 recharges to recover your investment becomes 15. Still an economy, sure, but not the one you thought you were getting. And if you cannot use 10 cells in your rig, think about the lower outputs, both audio and rf, when operating at the lower supply voltage.

Another consideration that you should think about is charge retention. Nicad cells will lose 10–12% of their charge per month unused, whereas alkaline cells can lose about 10–15% of

Primary	**Capacity**	**Secondary**	**Capacity**
AA	**mAh**	**AA**	**mAh**
Duracell Mn1500	1700	Gould 0.45 SC	450
Eveready E91	1600	Sanyo N450AA	450
Panasonic AM-3	1500	Panasonic NR-AA	500
C		**C**	
Duracell Mn1400	5000	Gould 2.0 SC	2000
Eveready	4400	Panasonic NR-C	1800
Panasonic AM-2	3900	Sanyo N2500-D	2500
D		**D**	
Duracell Mn1300	10,000	Gould 4.0 SC	4000
Eveready E95	9,100	Panasonic N2500-D	2500
Panasonic AM-1	9,300	Sanyo NR-d	2500

Table 1. Capacity of various batteries.

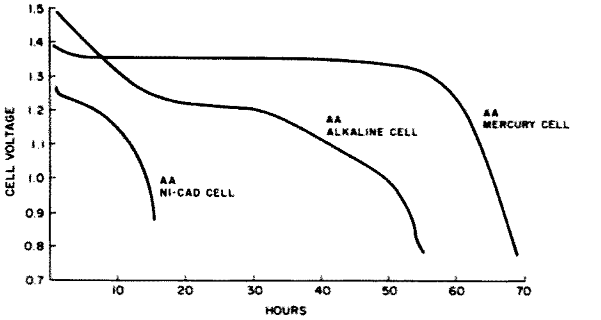


Fig. 1. Cell discharge curves. 25 Ohms continuous discharge.

rated capacity per year through shelf-discharge. Nicads are not the choice of battery to keep around in case of power failure, unless they can be trickle charged. You would be better served to keep a sack full of AA alkaline cells on the shelf for when the power goes off.

Fig. 1 shows the typical discharge curves for both alkaline and nicad cells. The curve for a typical mercury cell is also included for reference. AA mercury cells have a typical capacity of 2500 mAh, but cost nearly as much as nicads, thus are not cost-effective when compared to alkaline cells.

Table 1 is a listing of available primary and secondary cells with the manufacturer's ratings. Note the dramatic differences between cells and capacities.

Please note: I refer to *premium alkaline* cells. The LeClenche or zinc-carbon cell is *not* recommended for communications products for a myriad of reasons, one of which is capacity. Manufacturers of zinc-carbon cells typically publish no data on them because of their widely varying performance.

I am not saying that nicad batteries don't have their place, but in situations where it is important to keep a radio going over the long pull, when you can't recharge (no ac outlets in the woods looking for that lost child), or in foreign countries where your 110-volt charger will not operate, the premium alkaline cell offers many real, substantial advantages that cannot be overcome by nicads. ■

References

Gould Battery Handbook, 1973

Eveready Battery Engineering Data, 1976

Sanyo Cadnica Bulletin SF1542

Panasonic Sales Brochure 20M813/10M

Duracell Products Data Sheets

✓See List of Advertisers on page 114

Louis R. Mateo WB2MVK
1204 Augustina Avenue
Far Rockaway NY 11691

The Edison Effect

American inventor Thomas Edison is remembered for his array of electrical firsts. But lesser known is his invention of the first wireless telegraph.

The contributions that Thomas A. Edison made to the electrical world were many and are fully recognized by today's historians. His genius as a top-notch inventor is well known internationally and he is justly credited to be the most prolific and important pioneer of the electrical age. The duplex and quadruplex telegraphs, the light bulb, the gramophone, the camera, and the movie projector are only a few of his inventions. There were many more, accounting for about 1,300 different patents at the end of his creative life.

But did you know that Edison also experimented with electromagnetic waves several years before Hertz did? invented an inductive railroad telegraph? invented a wireless electrostatic communication system? discovered and applied the thermionic vacuum emission, creating, in effect, the first two-element tube rectifier?

In 1875, while experimenting with sound vibrations produced by a magnetic vibrator and ways to transmit them over wires to distant points, he noticed with curious amazement a peculiar light, or bright oscillating sparks, coming out of the core of the magnet. He had seen this phenomenon before in the telegraph relays and in loose filings between armatures and magnetic cores of telegraph printers, but so far attributed them to induction. These new sparks were somehow more intense and it occurred to him that they were not caused by induction. He wrote in his diary:

"We found that if we touched any part of the vibrator or magnet we got the spark. The larger the body of iron that touched the vibrator, the larger the spark. We now connected a wire to the end of the vibrating rod and we found we could get a spark from it by touching a piece of iron to it ... by connecting to the gas pipe we drew sparks from it in any part of the room ... "

He called this unknown electrical discharge "etheric force" or "etheric current" and conducted several randomly-directed experiments with it. It was not actually a discovery, since Joseph Henry noticed it much earlier, Faraday had speculated upon such a possibility before, and Maxwell had predicted it in 1823. Unaware of it at that time, Edi-

Edison with some original Edison-effect lamps.

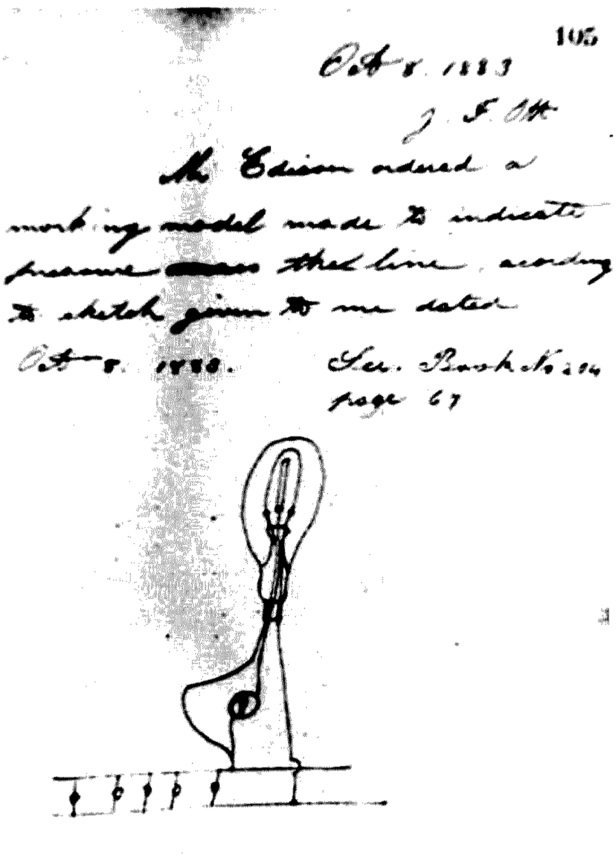
son had been playing with electromagnetic waves.

In order to observe the new force, he constructed a "black box" with two adjustable sharp-pointed carbons and an eyepiece on top. He made public the results of his tests and since Edison was always news, the local papers reproduced his declarations, adding a bit of spice for good measure. Their words were something like this: "Mr. Edison discovered a new electric ray and predicts that someday all telegraphic and cable communications will be carried out without poles or wires."

He demonstrated his black box and etheric forces to a scientific association in New York, which brought about a few congratulations and started a turmoil of opinions—both pro and con. The news traveled as far as Europe, and in England, physicist Sylvanus Thomson declared that all was based upon known electrical principles. Oliver Lodge, distinguished man of science and later a renowned wireless pioneer, discussed the experiments and arrived at the same conclusion. Edison did not pursue his investigations much further, perhaps resentful of being criticized by these known authorities, or maybe for the lack of a practical application for the forces; he continued his inventive career in the direction of "greener" pastures.

In 1880 we find Edison at work with a novel telegraphic system, which he called the "space" or "grasshopper" telegraph. He was assisted in this project by his good friend and colleague Ezra T. Gilliland. The idea was to provide a means of communication to train travelers in the long stretches of the western plains. It made use of a special telegraph line, strung on poles at car height on the opposite side of the regular telegraph line to eliminate the interference from them. The receiver employed an insulated metal plate on top of the car, connected in series with the secondary winding of an induction coil, and a telephone receiver. The circuit continued through the metal wheels and track to ground. The transmitter used a battery, a telegraph key, and a high-frequency buzzer, in series with the primary of the induction coil. A send/receive switch completed the installation.

Close-up of an Edison effect.



Entry in Edison's notebook showing lamp connected as a voltage indicator.

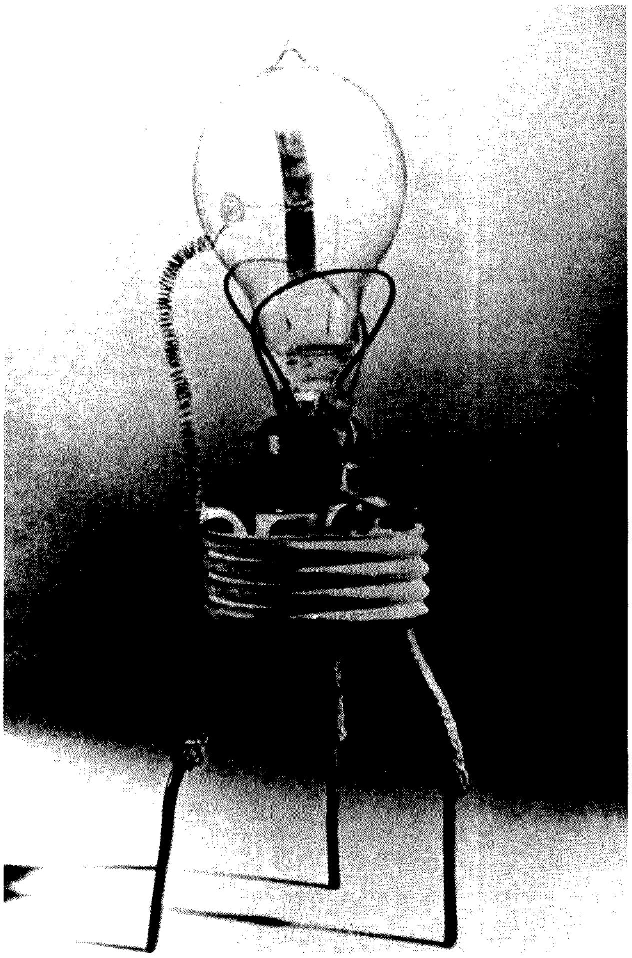
A duplicate set was to be installed at each telegraph office along the railroad line. The first tests were conducted on a small train in Staten Island NY and after a few failures and modifications, it was declared a success. Further experiments on the Lehigh Valley Railroad demonstrated the practicability of the grasshopper telegraph. It was never exploited and, although patented, apparently forgotten.

In 1855 at Menlo Park a wireless telegraphic system was developed by Edison. It used vertical masts of a hundred feet in length with metal plates on top. In his original patent he claimed to be able to communicate with points up to 3 miles distant and suggested that it could be installed on board ships, using their masts for the same purpose. He stated that communications between ships and between ships and shore could be established and collisions prevented during foggy days. As in the case of the grasshopper telegraph, the transmitter discharged an induction coil into the metal plate suspended on top of the mast. This induced a similar electrostatic charge on the plate of the receiving pole and the current thus created caused an audible click on the telephone receiver. It was never used commercially and when Edison was questioned about it, he declared with some air of mystery that, "It has been sold to a wealthy medium who wishes to communicate with the spiritual world."

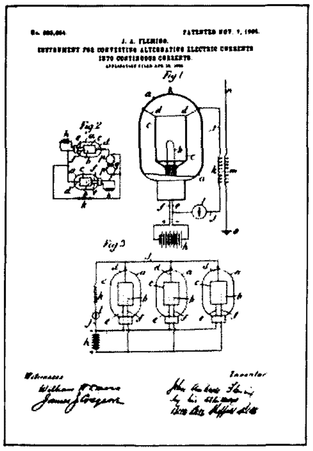
According to records found later, it was discovered that he had sold the patent, which also included the grasshopper telegraph, to the Marconi Company in 1904 (patent no. 465,771).

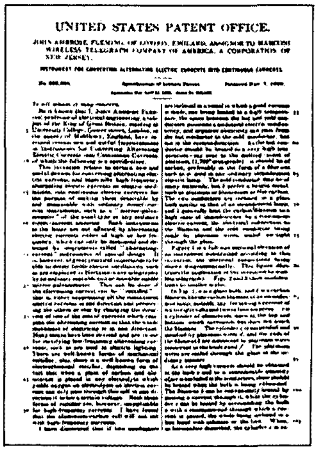
In 1880, while testing incandescent lamps, Edison observed that particles of carbon from the filament were "carried" and deposited on the inside of the glass bulb. He also discovered that after certain periods of operation there was a thin white line, similar to a shadow, parallel to the filament but to one side. The lamps were fed with direct current and it showed that this effect was caused on the side of the filament connected to the positive side. Notes were taken but shelved for future reference since his work on lighting and power plants required his full attention at that time.

Experiments done by other scientists some years before had proven that the air, when in contact with red-hot metals, showed



One of the Edison lamps used by Fleming in early experiments.




UNITED STATES PATENT OFFICE.

Copy of Fleming's US patent for use of the "valve" in ac rectification.

strange properties with regard to electrical charges. It was assumed (and sometimes emphatically affirmed) that electricity could not travel in a vacuum. Edison was aware of all these theories, but he never paid much attention to scientific assurances unless, of course, he could arrive at the same conclusions by experimentation. He was not a theoretician but a practical inventor. The question, "Was or was not the electricity the carrier of these particles of carbon?" was in his mind. He wanted an answer, he had to know and wanted to be sure.

Assuming that he installed another element inside the bulb and connected it to the positive side of the line, would it stop the flow of particles and keep the lamp clean inside? In 1882 he sketched a bulb with the added element, but it was not until the next year that he was able to spare the time to build and test the new lamp.

The second element consisted of a platinum wire suspended between the two filament legs and insulated by the glass. When it was connected to the positive side of the line, he found that a current flow was indicated in a galvanometer connected into that circuit, but when the new element was on the negative side, there was no current indication. He did many other experiments in order to determine the best size, form, and position of the second element and found out that the best shape was a flat metal plate installed between the filaments, without any electrical connection to any of them. The current thus obtained proved to be proportional to the incandescence of the lamp, or candlepower. This lamp was patented by Edison (patent no. 3,070,311) although its commercial use or application was vague at that moment.

What he created was in reality an electronic measuring device—the first one able to demonstrate that electricity, under certain conditions, could and would travel inside a vacuum. The reason why this truth was not fully understood at the beginning was that the nature of electricity was still a mystery, as far as electronic theory was concerned.

The lamp was shown at the 1884 International Electrical Exposition in Philadelphia PA and advertised as an indicator of incandescent voltages. Due to the lack of a better vacuum, the reliability was not of the first order. This time, however, Edison's discovery was received in a more favorable mood by the electrical elite. Visitors were frankly impressed by the tests conducted by Edison in person. The renowned professor Edwin J. Houston declared prophetically that "Edison's invention would become something of great importance in the future . . ." He was right. Sir William Preece, Engineer-in-Chief of the British Post Office, also an induction telegraph pioneer and later Marconi's protector and collaborator, who in the past had questioned some of Edison's electrical conclusions, visited the Exposition and was sincerely moved with the two-element lamp and acquired some of them for further study and evaluation. His conclusions were published in England and a paper about the subject was read at the Royal Society in 1885. He coined the phrase "Edison effect" in recognition of Edison's achievement.

Another well-known scientist, Dr. Ambrose Fleming, recently appointed electrical consultant to the new Edison London Lighting Company, obtained several of the two-element lamps, with the purpose of using them as indicators in generator circuits—without much success.

In 1897 the British physicist, J. J. Thomson, after experimenting with the lamps, concluded that the effect was caused by the emission of "electrons," or negative electricity, which flowed from the hot filament to the cold element or plate connected to a positive potential.

Edison did not pursue

these investigations much further and his discovery lay dormant for several years, that is, until 1904. At that time Dr. Ambrose Fleming—later knighted for his discoveries in the wireless telegraphic field—was employed as technical adviser by the Marconi Wireless Telegraph Co., Ltd., in London. Fleming was searching for a better detector to be used on the receivers manufactured by that company, since the magnetic detectors currently in use lacked sensitivity. He then recalled the tests that years before he had made with the Edison-effect lamps and concluded that they could be easily adapted for that purpose. He dedicated himself to investigating the lamp in scientific detail and to improving its operation, using higher vacuum and changing the plate to a cylinder surrounding the filament. He renamed them "oscillation valves" (this is why, in England, all vacuum tubes are still called valves) and applied for patents in England, Germany, and the United States.

Contrary to his claim, he did not invent the device, he simply used it as a high-frequency oscillation rectifier (it did not oscillate). Nor was he the first one to use it as a rectifier. Years later, as a result of litigations, his US patent was invalidated in favor of Edison's previous patent.

It did not matter very much anyway, since the Fleming valve did not make a great deal of difference as a detector of wireless signals. First, under the Marconi Company monopoly, it was supplied only to be used with their equipment and, second, it was less sensitive than the electrolytic and crystal detectors which appeared in the open market at about the same time.

We cannot deny that Dr. Fleming was a highly skilled and competent man of science who made abundant contributions to the wireless and later radio industry. His experiments with the two-element lamps revealed facts and set standards to be considered later in their manufacture. He drew up operational curves; he used new configurations, types of filaments, and shielding schemes, and was the first one to use them in conjunction with tuned circuits. But what really revolutionized the wireless art and converted it to "radio" (1912) was the addition of a third element or "grid" by Dr. Lee De Forest, which made the bulbs capable of being used as high-frequency detectors, amplifiers, and oscillators.

It has been said that Edison did not make any great scientific discovery, but by his skill, ingenuity, and power of observation, he was able to surpass in practical achievements many scientists with broad academic backgrounds. He was a real pioneer, perhaps the most important and imaginative of them all. He planted many seeds; others continued where he left off and a few collected the fruits. His work may not look like much to today's electronics students, where transistors, ICs, and computerized items dominate the industry, but it was the beginning—without it, radio, TV, and satellite communications would still be many years behind.* ■

References

The Saga of the Vacuum Tube, Gerald F. J. Tyne, H. W. Sams and Co., 1977.

The Edison Era, 1876-1892, Elfun Hall of History Publication, 1978.

Edison, a Biography, Matthew Josephson, McGraw-Hill, 1959.

*Other contributions made by Edison to the radio industry were the carbon microphone and the telephone receiver. The Edison battery was used as an emergency source on ships' radio stations.

See List of Advertisers on page 114

CORRECTIONS

Due to an oversight, reviews from our August and September issues were not included in our 1983 Annual Index published last month. Below is a corrected version.

TITLE	DESCRIPTION	AUTHOR	ISSUE
Advanced Computer Cont.	RC-850 Controller	WA3VUP	JAN 126
AEA	CK-2 Memory Keyer	W1XU	FEB 104
AEA	BT-1 Code Trainer	WB8JLG	MAR 104
AEA	Moscow Muffler	W1XU	MAY 120
AEA	MBA-RC Converter	N8RK	JUN 103
AEA	KT-2 Keyer/Trainer	WB8JLG	JUL 120
AEA	AMTOR TU	AI2M	NOV 98
Alden Electronics	Facsimile Recorder	W1XU	FEB 102
Autek Research	QF-1A Filter	WB8JLG	MAY 116
Arden	PCS-4000	WB8JLG	MAR 104
Blacksburg Group	Fist Fighter	W1XU	APR 103
Buckmaster Publishing	Call Directory	WB8JLG	FEB 106
Commsoft	RTTY89 Program	WB8PTH	SEP 96
Computer Applications	Pathfinder II	N8RK	JUN 102
Connect Systems	Private Patch	AG9V	NOV 99
Cushcraft	A3/A73 Tribander	AG9V	OCT 122
D&M Electronics	SPT-3000 RTTY Terminal	AA6SC	AUG 118
Dovetron	Widget	WB8JLG	MAY 102
Electronic Rainbow Inc.	Satellite TV Receiver	WB9ZNO	JAN 126
Foundation Publishing	The Best of Ham Radio	N8RK	APR 104
Gaitis	Apple RTTY Program	AE7V	APR 104
Gordon West	Code Tapes	WB8JLG	JUL 120
Hallward Products	Rad. Elec. Buyers Guide	W1XU	AUG 120
Harvey-Brain	Seychelles Saga	W1XU	JUN 104
Heath Co.	Ultrapro CW Keyboard	W8DFI	SEP 94
Heil Sound, Ltd.	HC-3 Mic Cartridge	WB8JLG	MAY 118
Hy Gain	TH7DX Tribander	K1XR	JUN 104
Icom	R-70 Receiver	WA2VSN	FEB 102
Icom	IC-490A Transceiver	K1KA	AUG 120
Icom	IC-720	W1XU	NOV 100
Icom	IC-751 Transceiver	WB6TOV	DEC 109
International DXers	Shortwave Equip. Review	AG9V	DEC 109
James Anderson	Ghost Fighter's Guide	N8RK	OCT 110
Kantronics	Hamsoft RTTY Program	WB8BTH	APR 107
Kenwood	Panadapter	K1XR	MAY 116
Kenwood	TS-430S	WA4BLC	JUN 102
Kenwood	TR-8400	K1KA	OCT 108
Kenwood	TR-9500	K1KA	NOV 97
Larsen	Mobile Mount	WB8JLG	APR 102
Metheus Corporation	13M2KR Storm Alert	K9MX	JAN 129
MFJ	Econo-Tuner	WB8JLG	OCT 110
Palomar Engineers	PT-402 Antenna Tuner	WB8JLG	FEB 105
QZX Newsletter	Newsletter	WB8JLG	AUG 120
R.L. Drake Co.	9000E Comm. Terminal	W6SWZ	SEP 90
RSGB	VHF/UHF Manual	WB8JLG	JUL 119
Santec	ST-uP Handie-Talkies	W2TVS	OCT 109
Ten-Tec	Corsair Transceiver	W1XU	MAR 105
Universal Electronics	RTTY Callbooks	WB8JLG	MAR 108
Universal Software	Super-Ratt Program	N8RK	SEP 90
W.H. Nail Co.	Egbert II Program	N8RK	SEP 95
Yaesu	FT-102	WB8JLG	MAY 116

In his article "The Magical Audio Filter" (November), Jim Pepper incorrectly states that the notch frequency of Fig. 1 varies directly as R4 and by the square root of C1 and C2. However, his formula indicates that the frequency varies inversely as B4 and inversely as the square root of C1 and C2. Thus, double R4 divides the frequency by two. Also, doubling either C1 or C2 reduces the frequency to .707 its original value.

Boyd Skillin K6MGY
Fresno CA

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

WEST ALLIS WI
JAN 7

The West Allis Radio Amateur Club will hold its 12th annual Midwinter Swapfest on Saturday, January 7, 1984, beginning at 8:00 am, at the Waukesha County Expo Center Forum (take I-94 to Co. F, then south to FT, then west to Expo). Admission is $2.00 in advance and $3.00 at the door. Tables are $3.00 in advance (reserved until 11:00 am) and $4.00 at the door on a first-come, first-served basis. Delicious food will be available. For tickets or more information, send SASE to WARAC, PO Box 1072, Milwaukee WI 53201.

SOUTH BEND IN
JAN 8

A hamfest swap & shop will be held on Sunday, January 8, 1984, at Century Center, downtown on US 33 Oneway North between the St. Joseph Bank Building and the river, South Bend IN. Tables are $3.00 each in a carpeted half-acre room. The Industrial History Museum is in the same building. Four-lane highways lead to the door from all directions. Talk-in on .52/.52, .99/.39, .93/.33, .78/.18, .69/.09, 145.43, and 145.29. For more information, contact Wayne Werts K9IXU, 1889 Riverside Drive, South Bend IN 46616, or phone (219)-233-5307.

SARASOTA FL
JAN 14-15

The Sarasota Amateur Radio Association will hold its 5th annual Sarasota Hamfest on Saturday and Sunday, January 14-15, 1984, at the Exhibition Hall, 801 N. Tamiami Trail (US 41), Sarasota FL. The hours on Saturday are from 8:30 am to 4:30 pm and on Sunday, from 8:30 am to 3:00 pm. Donations, good for both days, are $3.00 in advance and $4.00 at the door. The swap-table donation is $12.00 for both days and includes the door donation. No one-day tables will be available and advance registrations are requested. Talk-in on 146.91/.13 primary and 146.73/.13 secondary. For advance tickets, booths, and tables, contact Dave Johnson, Jr. W4CCR, 2619 Forest Lane, Sarasota FL 33581, or call (813)-924-2525, or write Sarasota Hamfest, PO Box 3182, Sarasota FL 33578.

RICHMOND VA
JAN 15

The Richmond Amateur Telecommunications Society will hold its Frostfest '84 Winter Amateur Radio and Computer Show on Sunday, January 15, 1984, from 8:00 am to 4:00 pm, at the Virginia State Fairgrounds, Richmond VA. All events will be indoors and general admission is $4.00. Flea-market spaces are $3.00 and tables are available for $3.50. KX4Y will give Novice examinations. Doors will be open for unloading and setups beginning Saturday noon and a security guard will be on duty all night. Talk-in on 146.28/.88 and 146.34/.94. For more information, contact Bill Scruggs N4DDM at (804)-272-8206, or write Richmond Frostfest, PO Box 1070, Richmond VA 23208.

YONKERS NY
JAN 22

The Yonkers Amateur Radio Club will sponsor the Yonkers Electronics Auction on Sunday, January 22, 1984, from 9:00 am to 3:00 pm, at Lempko Hall, 556 Yonkers Avenue, Yonkers NY. Admission for buyers and sellers is $3.00 each; children under 8 will be admitted free. New and used equipment will be auctioned and can be inspected from 9:00 am to 10:00 am. There will be plenty of seats and parking and the auction will start at 10:00 am sharp. Unlimited free coffee will be available all day. The club will charge a 10% commission on the first $100 and 5% on the remainder on successful sales only. Talk-in on 146.265T/146.865R and .52 direct. For more information, write YARC, 53 Hay-

ward Street, Yonkers NY 10704, or phone (914)-969-1053.

TRAVERSE CITY MI
FEB 11

The Cherryland Amateur Radio Club will hold its 10th annual swap and shop on February 11, 1984, from 8:00 am to 1:00 pm, at the Immaculate Conception School Gym, 2 blocks south and 1 block west of the intersection of M-37 and M-22, Traverse City MI. Registration will be at the door. Talk-in on 146.25/.85. For more information, call Jerry Cermak K8YVU at (616)-947-4848.

MANSFIELD OH
FEB 12

The Mansfield Midwinter Hamfest/Auction will be held on Sunday, February 12, 1984, beginning at 8:00 am, at the Richland County Fairgrounds, Mansfield OH. Tickets are $2.00 in advance and $3.00 at the door. Tables are $5.00 in advance and $6.00 at the door. Half tables are available. Talk-in on 146.34/.94. For additional information or advance tickets and tables, send an SASE to Dean Wrasse KB8MG, 1094 Beal Road, Mansfield OH 44905, or phone (419)-589-2415.

GLASGOW KY
FEB 25

The annual Glasgow Swapfest will be held on Saturday, February 25, 1984, beginning at 8:00 am Central time, at the Glasgow Flea Market Building, 2 miles south of Glasgow, just off highway 31E. Admission is $2.00 per person. There is no additional charge for exhibitors. The first table per exhibitor will be free, and extra tables will be available for $3.00 each. There will be a large heated building, free parking, free coffee, and a large flea market. Talk-in on 146.34/.94 or 147.63/.03. For further information, write Bernie Schwitzgebel WA4JZO, 121 Adairland Court, Glasgow KY 42141.

FRIDLEY MN
FEB 25

The Robbinsdale Amateur Radio Club will hold its 3rd annual Midwinter Madness Hobby Electronics Show on Saturday, February 25, 1984, from 9:00 am to 3:00 pm, at Totino-Grace High School, 1350 Gardena Avenue NE, Fridley MN (a Minneapolis suburb). Admission is $3.00 in advance and $4.00 at the door. There will be manufacturers and dealers of ham, computer, satellite, and R/C gear, as well as seminars and a flea market. Talk-in on 146.52 simplex or the 147.60/.00 repeater (K0LTC). For more information, contact Robbinsdale ARC, PO Box 22613, Robbinsdale MN 55422, or call Bob at (612)-533-7354.

AKRON OH
FEB 28

The Cuyahoga Falls ARC will hold its 30th annual electronic equipment auction and hamfest on Sunday, February 26, 1984, from 8:00 am to 4:00 pm, at North High School, Akron OH. There is easy access from the Tallmadge Avenue off-ramp of North Expressway (Rte. 8). Tickets are $2.50 in advance and $3.00 at the door. Some tables are available for $2.00 or sellers may bring their own; advance reservations are advised. Talk-in on .87/.27. For more details or reservations (please include an SASE), write CFARC, PO Box 6, Cuyahoga Falls OH 44222. Table reservations may also be made by calling Bill Sovinsky K8JSL at (216)-923-3830 and will be held until 9:00 am.

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½" x 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye." and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

I need a schematic and manual for Lafayette FET multimeter #99-50833. I will pay copying costs.

Keith Heryford
PO Box F
Cedarville CA 96104

I would like to hear from anyone who has successfully interfaced a Commodore VIC-1525 printer to a Hal CT-2100 communications terminal either to the ASCII printer or RS-232C serial output of the Hal terminal.

Karl Thurber W8FX
317 Poplar Drive
Millbrook AL 36054

Our club station (VE2CLL) needs schematics and service manuals for the Hallicrafters HT-45 linear and P-45 power supply.

Harold Carmichael VE2ELN
257 St. Leon St.
Quebec City
Quebec G1K 1B8
Canada

I need an up-to-date tube-checking list for a B&K Dyna-Quik Model 500 tube tester. I have the list that is attached to the top of the case but I need a more modern list. The manufacturer says that it is out of print. Drop me a line letting me know what you have.

Gene V. Mock W4RHD
Rt. 9, Box 64-5
Fayetteville AR 72701

I need any and all technical information and manuals on the Central Electronics Model 100V transmitter. I also am interested in salvage units for parts. I will pay all expenses.

W. Van Lennep
PO Box 211
Pepperell MA 01463
(617)-433-6031

I need a copy of the tech manual/schematic of the Tektronix 535A oscilloscope. I will copy and return, or quote price for a good copy.

Hank Dean N8DOE
408 Brisbane Ave.
Westerville OH 43081

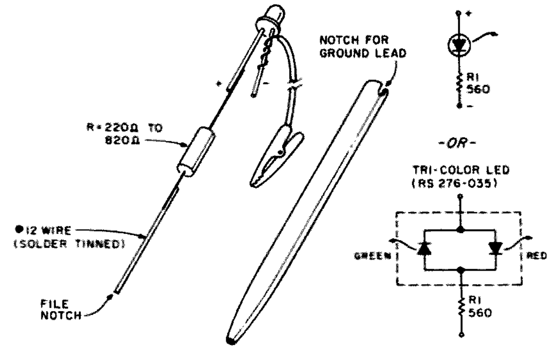
I would like to hear from anyone who has successfully changed the early Yaesu 101 6JS6 finals to 6146s.

R. F. Bricker K4CSV
PO Box 295
Fort White FL 32038

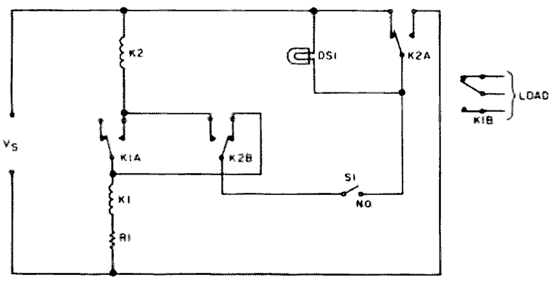
CIRCUITS

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

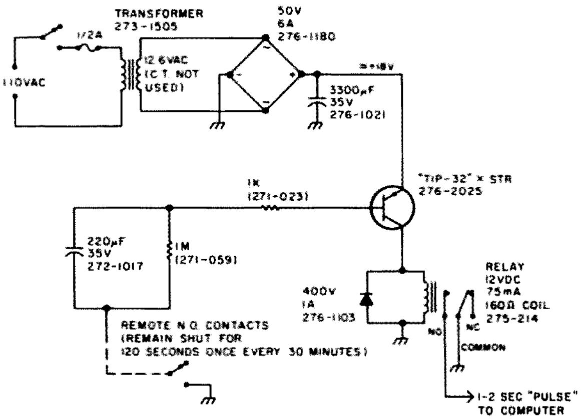
In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices,* 73 Magazine, *Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*



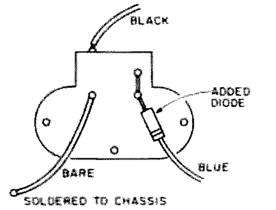
WORLD'S CHEAPEST IC TEST PROBE: The wire and resistor assembly should be about 4 inches long; work it into a ball-point pen case and glue the LED to the top. With a 560-Ohm resistor, this probe will handle up to 16 V.—Jim Hyde WB4TYL, Waycross GA.



RELAY FLIP-FLOP: Here is a way to make two inexpensive DPDT relays act like an R-S flip-flop. One press of push-button switch S1 sets it; a second press resets it. Indicator DS1 shows when the circuit is set. Use contacts K1B to control the load. The two relays must have the same coil-voltage rating, which must be equal to one-half of the supply voltage, Vs. Choose R1 to reduce holding current if desired.—Terry Simonds WB4FXD, Edgartown MA.

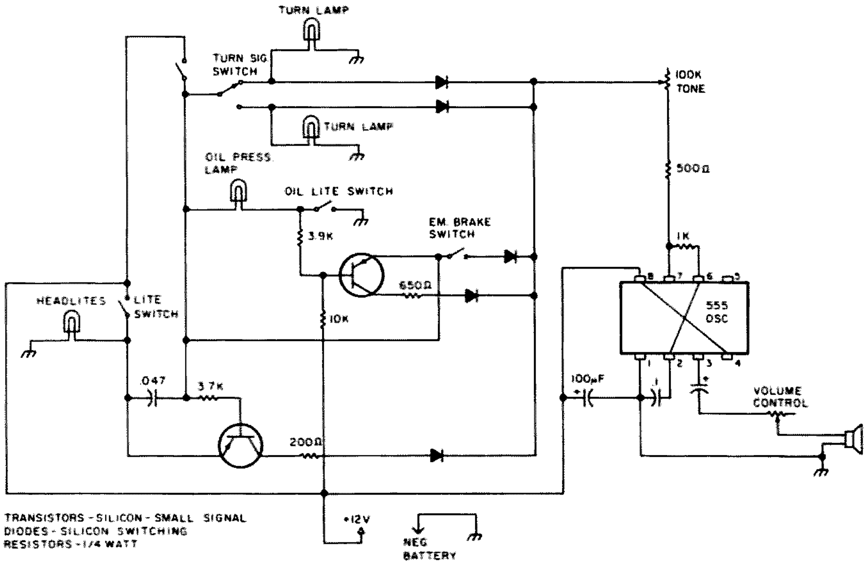


REMOTE-SWITCH TIME LIMITER: This circuit will produce a 1-2 second pulse when the remote switch contacts are closed for any length of time. When the remote switch closes, the 220-uF capacitor charges through the base-emitter junction of the transistor. The 1k resistor limits the current flow. As the capacitor charges, the current drops off until the transistor stops conducting. The on/off cycling pulls the relay in and then drops it out again. The 1-meg resistor discharges the capacitor when the remote contacts open again.—Jeffrey Blackmon W2YI, Beavercreek OH.



ENLARGED VIEW OF *EXT BACK UP* SOCKET AS SEEN FROM INSIDE CHASSIS

MEMORY SAVER FOR THE KENWOOD TR-7800: The Kenwood has nicad batteries to keep the memory intact when you unplug the rig. However, if you leave the power switch on when the rig is unplugged, the batteries will also try to power the rig—resulting in a very short memory life. To keep this from happening, first locate the blue wire connected to the "EXT BACKUP" socket. Remove this wire from the socket and insert a small diode between the end of the wire and the terminal to which it was formerly connected. The cathode end should be hooked up to the wire. Any small diode will do, provided it has no significant reverse current at 20 volts and as little forward resistance as possible.—H. F. Viney VE3AZX, Nepean, Ontario, Canada.



AUTOMOBILE EARLY-WARNING SYSTEM: Hook this up to your car and you will never leave your lights on again. The circuit also provides an audible turn-signal indicator, as well as warns you when your emergency brake is on. Another connection to the oil-pressure light will tell you when the pressure is low.—Keith Barrigar W7KQD, Lebanon OR.

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

REPEATERS

This month's column is dedicated to the memory of WR2APG, a fine machine that died of neglect because it operated on 220 MHz instead of 2 meters. Funny, at the time I thought a repeater that specialized in RTTY, SSTV, and FAX would be successful.

ELEMENT 1—MULTIPLE CHOICE

1) What is a station master?
  1) A brand of repeater antenna
  2) Slang for a repeater control operator
  3) The name of Motorola's repeater line
  4) A type of phone patch

2) In most ham applications, Motorola's HT-220 operates on:
  1) 50 MHz
  2) 145 MHz
  3) 220 MHz
  4) 440 MHz

3) The Private Line subaudible tone system was invented by:
  1) General Electric
  2) RCA
  3) Motorola
  4) Kenwood

4) In which year did the amateur 6-meter band open?
  1) 1968
  2) 1919
  3) 1923
  4) 1945

5) Who invented FM?
  1) Colonel Perkins
  2) Major Armstrong
  3) Captain Andrews
  4) General Stupidity

ELEMENT 2—MATCHING

Match the past and present 2-meter transceivers with their manufacturers.

Column A	Column B
1) Carfone	A) Icom
2) Brimstone 144	B) KLM
3) Marker-Luxury (ML-2)	C) Swan
	D) Azden
4) Voice Commander III	E) Motorola
	F) Yaesu
5) HR-2A	G) Santec
6) Multi 11	H) General Electric
7) FM-DX	I) Tempo
8) HW-2036	J) Kenwood
9) IC-2AT	K) RCA
10) Metrum II	L) Satan Electronics
11) PCS-4500	
12) TM-201A	M) Heathkit
13) 144uP	N) Clegg
14) GTX-202	O) VHF Engineering
15) FM-2X	P) Drake
16) VHF-1	Q) Midland
17) TRX-144	R) FM Laboratories
18) 1402 SM	S) Genave
19) FT-221	T) Wilson
20) 13-510A	U) Regency

ELEMENT 3—SCRAMBLED WORDS

Unscramble these examples of repeater terminology:

RMMEJA	PUSR
TCHAPTOAU	PLUDXE
PERTREEA	TILSP
LENNCHA	QUELCHS
FOFEST	PIMXSLE

THE ANSWERS

Element 1:

1—1 Made by Phelps-Dodge and very popular.
2—2 Doesn't make much sense, does it?
3—3 Ever notice how many "subaudible" tones really aren't?
4—4 Hmmm. Just a couple of years before TV.
5—2 Major Edwin H. Armstrong, who later killed himself when the boys at the radio networks tried to cheat him out of his royalties.

Element 2:

1-K, 2-L, 3-P, 4-H, 5-U, 6-B, 7-N, 8-M, 9-A, 10-E, 11-D, 12-J, 13-G, 14-S, 15-C, 16-I, 17-O, 18-T, 19-F, 20-Q.

Element 3:

(Reading from left to right) JAMMER, SPUR, AUTOPATCH, DUPLEX, REPEATER, SPLIT, CHANNEL, SQUELCH, OFFSET, SIMPLEX.

SCORING

Element 1:
Six points for each correct answer.
Element 2:
One and one-half points per match.
Element 3:
Three points for each word unscrambled.

How well do you repeat?

1-20 points—Have never ventured beyond 14 MHz
21-40 points—Think that 2-meter radiation is harmful
41-60 points—Use 2 meters when the CB is broken
61-80 points—Take your HT along on dates
81 + points—Hopelessly addicted

AUTHOR'S CORNER

In these last few lines of this month's column I would like to respond to a point raised by Mark Regan of Reynoldsburg, Ohio. In a letter appearing in the August, 1983, "Letters" column, Mr. Regan claims that my comments in response to a "FUN!" poll question on religious nets proves that I wish "to deny the right of free speech to those who like to talk about ideas of a religious nature."

Not true, Mr. Regan. I certainly have no objection to bible discussions or any other sort of on-air religious activity that conforms to FCC rules. If my comment gave an anti-free-speech impression, as Mr. Regan asserts, I'm sorry. To set the matter straight, I believe in free speech for all.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

Happy New Year! I don't know how long I have been waiting for this year to finally arrive. I guess it has been ever since I read the book—George Orwell's, that is. But this year seems no more frightening than last, even though the technology for some of Mr. Orwell's more frightening machinery does exist. Hopefully, however, we will use this technology for good, progressive communication.

We do have a touch of "newspeak," however. Ever hear of a CBBS? How about an ABBS, Tariboard, PMS, or other such cryptic phrase? To the computer buff, these bulletin-board systems (BBS) represent the "Citizens Band" (if you will forgive the expression) of computing. They offer a source of bulletins, a pipeline for programs, and a kind of public soapbox and maildrop that is available for the cost of a phone call. It shouldn't surprise you, then, that we hams have our own form of BBS on the air—usually called a RTTY mailbox system.

Made possible by any of a number of microcomputers, these versatile fusions of hardware and software create a kind of, well, let's call it a repeater, which can be called up, accessed, and used much as our computer buff's BBS can. But ours is on the radio, not the telephone!

I know that you all are interested in these systems, with a representative letter this month coming from Bob Wallace W9STA/2, in New York City. Bob writes, "Do you have any information regarding the RTTY mailboxes such as frequency, location, and how these things are accessed?"

Well, Art Santella K1VKO passes along the following information about one such system, the WA1GOO mailbox, in Rowayton, Connecticut. Art tells me that the system is on 146.580 MHz, twenty-four hours a day, idling at 60 wpm. A user accessing the machine can switch it to 100-wpm Murray or 110-baud ASCII. The machine covers a large area of Long Island and Connecticut, being located on the coastline of Long Island Sound. Operating simplex, with a Station Master antenna, Art tells me that plans are in the mill to raise the antenna to 100 feet, using a hardline feed, and a linear may be added to boost the output even more. Further down the line, a twenty-meter mailbox may be added, with a link to the VHF machine. This would give a super way to reach in and out of the Long Island area for local and DX stations.

A look at the directory on line recently shows about thirty files, including listings of computer nets, an RBBS directory, Miami weather frequencies, a W1AW schedule, various ARRL and other bulletins, several articles on RTTY and computers, and other items of interest. Even recent DX stations worked are listed, with times and frequencies, to aid other operators in their search for the rare country.

The system uses the Super-RATT™ software that we mentioned here a few months back. Some of the commands available include the ability to save or read messages on the system disk, scan recent news or weather bulletins, look at the user file, set mode to Murray code at 45 baud (60 wpm), 74 baud, 110 baud, or ASCII at 110 baud, even the ability to look at four analog-to-digital converters. I don't know what you would use that for!

If you are interested in this system, Art would be happy to send you a full list of commands and such. Just send a business-size SASE to Art Santella K1VKO, 43 Seaview Avenue, East Norwalk CT 06855, and ask for the information on the WA1GOO mailbox. Be sure to tell him you saw it in "RTTY Loop."

A look at the mailbox on my front curb produces this letter from Roy D. Thomas KA4VVJ. Roy would like to find a source for in-depth information on several of the microprocessor chips around. He relates having information on the 6800 (a fine chip!) but wants to learn more about the 8080, Z-80, 6502, and others. He also wants to know where you can buy any of these chips.

Well Roy, let's cover that last question first. Any good computer center or parts house should stock those CPU chips mentioned above, along with the support chips needed to build a functioning system. I would caution, however, that it takes a fair piece more than a chip and a power supply to make a computer. So, before you go out and buy a chip for ten bucks or so, it would do you well to read quite a bit and decide on just what you want to accomplish.

There is a raft of books out there, ranging from highly technical masterpieces of obfuscation to primers that spend hundreds of pages to teach a few elementary facts. The best bet is to read a few of the computer magazines which cover all bases, such as *Microcomputing*, and look at back issues, which should be in any reasonably sized library, to get a grasp on the hardware involved. In the ads in these magazines you will find a great number of books on microprocessors, and many of these books will be reviewed in the magazines as well. Look them over; I am sure you will find enough information to keep you busy for some time to come.

Above all, please realize that, with few exceptions, it makes little difference which microprocessor chip is ultimately used. How well and flexibly the software is written, how well the system, once configured, will do the task at hand, and what the upward compatibility is (will it become obsolete next year?) are all valid considerations.

A thank you to you all, the readers of "RTTY Loop," is sent along by way of Barry Travis N4FNZ. Barry, you may recall, needed a hard-to-find CRT for his oscilloscope. Well you all came through, and Barry is watching dancing green lines once again.

A new request comes from Henry Kirchmer KF4UW. Henry is looking for help in putting a Yaesu FT-107 on RTTY. He also would like to find a RTTY interface for the Timex/Sinclair 1000. I did not find any T/S-1000 interfaces in my review last month, Henry. But I am sure that any reader with information would be glad to drop you a note at 30 Patrick Lane, Rockledge FL 32955. Send me a copy, too, folks—thanks.

Another ham looking for help is Tom Childers WA5ZVZ. Tom has purchased a Teletype® Model 35 and plans to use it as a printer for his TRS-80C®. He is looking for help in connecting the loop supply of the teleprinter to his computer. Well, Tom, I have zip in the way of information on the Model 35; I am sure that at least one of our readers does, however, maybe even having hooked up the thing as you want to. If

so, I am sure that you will receive a note at 7189 Westbranch, Olive Branch MS 38654, very soon. If I hear anything here, I'll let you know.

In case any hams in the southern California area have never heard of SCATS (the Southern Counties Amateur Teleprinter Society), and I find that hard to believe, the club operates a two-meter repeater on 146.10/146.70 MHz, located in the north San Fernando Valley, and another repeater on 223.12/224.72 MHz on the Palo Verdes hills. These are Murray RTTY repeaters, open to all. The current president of the club is Sid Heyman WB6FFW. Interested amateurs are invited to drop a note to the editor of SCATTER, the society's newsletter, Hugh Washburn WA6IEX, 5772 Garden Grove Blvd., Sp 415, Westminister CA 92683, for more information.

I would like to take a moment to address a rather select group of readers. Any of you who are using 6800 or 6809 systems under the Smoke Signal DOS68 or DOS69 systems are invited to drop me a line with your name, address, and whatever system details you care to offer. I am looking to get a sense of how big the DOS68/DOS69 group is compared with the FLEX bunch, so that we can see some more of our system's stuff in print. Thanks.

As I have said before, I always enjoy hearing about your experiences with the newer RTTY equipment. This month, let me present one man's experiences. Ronald Kenneady N2DWN writes: "I have been reading 'RTTY Loop' for quite some time now and with the advent of computers, interfaces, printers, and solid-state rigs, I have finally decided to plunge in.

"And when I plunge in I *plunge in*! I've acquired a Kenwood TS130S, a Kantronics Interface, and a VIC-20 computer, along with the VIC dataset, disk drive, and dot-matrix printer. Right out of the box everything worked, except the interface.

"But, not to worry, the folks at Kantronics are great people and Mr. Travis Brann stayed on the telephone with me quite some time trying to figure out why every time I plugged in the computer-to-interface cord the Kenwood went into transmit mode. He finally decided that it must be a defective cable and said that he would send me a new cable.

"Not wanting to wait for the UPS truck, I pulled the cap off the game port end of the connector and began to experiment. The wire-to-pin scheme that Travis Brann had given me said that I should be looking at the brown wire to pin 1, the red wire to pin 2, white to pin 3, green to pin 6, and black to pin 8. Not so and it's not Kantronics' fault! It's the connector itself. Pins 1, 2, and 3 (on the top side) are correct, however, on the bottom, it's a different story. The numbering order has been reversed. Therefore, by placing the green wire in the connector slot marked for pin 8 and the black in the slot for pin 6, all systems become a GO! The black wire in this cable is a double wire attached to shield, and therefore, somewhere along the line, to ground. Grounding pin 8 will activate the PTT circuit in the Kenwood and jump to transmit mode. If other hams are having problems of this nature they would do well to check the wiring to the pin in the game port.

"If you decide to use the Kantronics Interface, be careful with the operating voltage and current. If the input is not at least 12 volts at 1.5 Amps, it just won't work. If the interface can't pull enough current from the source, the entire bar graph and LED tuning light will light up and signals will not pass in either direction. Another hint for operation troubleshooting: All power must be on in order to operate. The monitor, computer, interface, transceiver, and printer (if attached) must all have power on in order to operate. Turn one of them off and the whole system will go down. According to Travis Brann it's a built-in feature."

Well, I really appreciate these impressions of the Kantronics unit, and I am sure that those readers considering putting a computer on the air do as well. I will try to cover more of the material you ask about in the coming months. Please remember, if you would like a personal reply to a letter, enclose an SASE. Thanks. So long for now—stay tuned for next month's "RTTY Loop."

LETTERS

WINNER!

In my opinion, your recent introduction of the "73 International" column has set your publication apart from all the others.

The use of correspondents "in country" makes the contents believable. The use of full-color national flags in the headings is a stroke of genius.

It seems to me that beyond the real service that this column provides to worldwide amateurs, it provides an insight to the correspondents' countries to the non-amateurs who may come across it. The Lord knows the world needs all the help it can get! Hope springs eternal that before long you will have correspondents in TA-, CN-, 4S-, 5R-, and perhaps even SP- and (dare I wish?) U-lands.

Finally, it is obvious that the inputs from some of the non-English-speaking correspondents have been *transliterated*, rather than *translated*. The difference is best illustrated by the line from the song: "Throw Mama from the train a kiss" (trans*literation*). The German when trans*lated* would be: "Throw a kiss to Mama from the train." To the thinking person, I believe this enhances the credence of the correspondents. Please don't edit them, except possibly for length.

Wayne, you have another winner!

Thomas L. Bowers III WD4CQY
Eustis FL

OFF-BASE COLUMN?

I am not given to writing letters to the editor, but after reading a column in the August issue of *73*, I am moved to put in my two cents worth. The column I am referring to was part of "*73* International" and was written by Roy Waite W9PQN concerning his views on amateur radio in Japan . . . and other non-related items.

Mr. Waite's comments made for interesting reading. Unfortunately, his statements were somewhat incomplete, incorrect, and outdated. Some were not even relevant to amateur radio.

There is a general statement that foreigners living in Japan often make that applies: Nothing in Japan is easy. It is a bureaucratic, red-tape, paperwork nightmare. It also makes for full employment! Mr. Waite attempted to tie Japanese procedures, rules, and regulations to the American way of doing business. That is like comparing apples to oranges. We have an outstanding country, but in my opinion, we have too liberal rules and regulations covering a wide range of rights accorded to visiting foreigners, both the legal and illegal type. But Japan is the subject here, not America.

First, it is not easy for a foreigner to obtain a license and permission to operate an amateur-radio station in Japan, but it can be done. The number doing so is quite large, surprisingly so. However, for the short-term tourist, it is almost impossible. Anyone having a valid amateur license issued by another country can apply for permission to operate on the correct form obtained from the Telecommunications Commission. The next, and often most difficult, step is finding a radio club that will allow you to use their club callsign. Only one individual at a time can use the club callsign. The other way for a foreigner to get on the air is to take the written exam in Japanese. Do that and you get your license and callsign like any other amateur. The last time I checked, the American exam was not given in Japanese—only English—so anyone who desires a regular American license must know our language.

In Japan, there are four classes of license: first class, second class, telegraphy, and telephony. First and second class can operate 100 Watts. The strict government inspection that Mr. Waite referred to plus the $100 charge are things of the past. JARL has been given the authority to inspect and approve 100-Watt (and for first class, up to 500-Watt) stations. The modern equipment used by most amateurs makes the inspection routine.

Much has been made by Mr. Waite and others of the large numbers of Japanese who hold the lowest-class license. They attempt to equate it to CB and a lack of technical expertise. Actually, this is not the case. The level of technical know-how among average Japanese amateurs is higher than that of the average American Novice. What is more important, technical ability and knowledge or the ability to copy CW at 12 words per minute (9 wpm for the second class, which is about equal to our General class)? In technical skills and knowledge, the holders of the lowest-level license in Japan are *not* Novices.

I also disagree with the statement that in Japan amateur radio is merely an extension of the Citizens Band, including its numerous abuses, bad manners, overcrowding, and lack of what amateur radio is all about. What is amateur radio all about anyway? It is a hobby. It is fun. It is communicating with others who enjoy the same thing. There is no requirement to do research or experiment or build homebrew equipment. The general consensus of opinion is that the more people involved with amateur radio (or any other hobby), the better off it is. More people involved means band crowding. It also means an increased likelihood of more experimenters and developers, more domestic equipment, a larger market, and a fresh infusion of "new blood" to prevent stagnation. I've heard my share of pileups and bad manners from English-speaking operators. One additional point needs to be remembered (and recognized): The holder of the license, even the telephony class, must clearly demonstrate technical knowledge . . . something that the stateside CB operator does not have to do. As a matter of fact, Japan has a new "sport band" in the 900-MHz range that requires no license. Putting CB up there makes more sense than in the upper HF range where ours is.

One small but important (to the few involved) aspect of amateur radio in Japan that was not covered by Mr. Waite is the KA callsign. Under an agreement between the governments of Japan and the US, amateurs who are stationed with the US military in Japan and who reside on a US military installation can be issued a special license and a KA callsign. The callsign consists of the KA prefix, a number corresponding to the part of the country where the radio is located, and by a two-letter suffix. The interesting part is that the operating privileges accorded the amateur are the same for the holder of the Novice-class US license as they are for the holder of the Extra-class ticket. In addition, they are expanded over what is authorized in the US. For example, KA stations are granted permission to operate voice from 14.000 to 14.350 and from 21.000 to 21.450. Therefore, the holders of the KA call can legally talk with foreign stations on frequencies well outside of those normally authorized. Even a Novice, something Mr. Waite seems to think is not worth much, can talk to his heart's content with any station outside of Japan on frequencies even a US Extra ticket holder cannot use. I'm sure that must rub some "real hams" the wrong way! The two noteworthy limitations to the KA callsign are: (1) the station must be fixed-base, no mobile operations allowed (and, of course, the station must be on a US facility), and (2) no contact with Japanese stations and no third party ops are allowed.

Unfortunately, even though the KA callsigns are often listed in the callsign directory, many amateurs are not familiar with them and (1) think we are stateside or (2) don't realize that we can legally operate outside of the normal limits followed by US hams stateside.

One aspect of Mr. Waite's column that I objected to the most was the voicing of his opinions of the policies of the Japanese government. Japan is not America. His comments are best directed toward his congressman. I don't necessarily agree with many of the official or unofficial policies practiced by the Japanese government or the population at large. However, amateur radio is supposed to transcend politics. Describing the living place of the average Japanese as a "rabbit hutch" or "hovel" has no place in your magazine nor do discussions of his opinion of their attempts to protect Japanese domestic production. I have lived in Japan for the past six years and do not agree with his assessment of the living conditions of the local population . . . but my opinion really should not show up in print in an amateur-radio magazine any more than his should. We want to improve international relations and increase goodwill between hams, not torpedo it.

I hate to say it, but the July issue of that unnameable magazine, on page 60, gave a better summation of the Japanese license than did Mr. Waite. No politics or opinions, just the correct facts.

Thank you for your time.

Cdr. William W. Radican N7CAD/KA2WR
San Francisco CA

I wouldn't want to say that I am more qualified to comment on amateur radio (or

anything else in Japan) than Cdr. Radican after his six years in Japan, but I would think that my 20+ years in Japan, having associated with Japanese hams of all classes as well as foreign hams, might give me a slight edge.

Cdr. Radican begins his essay by stating that my statements were incorrect and outdated. No way! In rechecking the column in question, I find no misstatement of fact of any kind, nor is the information outdated. My friends in the JARL (including President Hara), Ministry of Posts and Telecommunications, and CQ Ham Radio wouldn't let me down. The only fact that has changed since the column appeared (which Cdr. Radican attempts but fails to explain correctly) occurred after 73 went to press. This was the change in the rule which eliminates station inspection for stations of 100 Watts or less (previously 10 Watts or less). And this was brought about only because the American side would not sign a reciprocal agreement that required a station to be inspected prior to issuance of a license. The JARL successfully negotiated that point with the very stubborn Ministry of Posts. It has now become more probable that a reciprocal agreement will be signed, but the Japanese side still wants to charge 7,000 yen per application (equivalent to about $28). This is not exactly reciprocity, or course, because as far as I know, most (if not all) of the major nations make no charge at all, or only a nominal charge at most. But maybe we can live with that. I am not sure the US will agree, though.

Cdr. Radican states that the JARL has been given permission to inspect first-class stations up to 500 Watts. Not true. The JARL has been given authority to waive inspections for any stations of 100 Watts or less (output power). Incidentally, inspections are not necessarily as routine as Cdr. Radican would have us believe. It depends on the inspector, the weather, if he likes the way you comb your hair, etc. Several of my Japanese friends have told me some hair-raising tales about these inspections. And you have to wait as long as six months for the inspectors to come before you can operate. A short-term visitor to Japan wouldn't even be here that long!

Cdr. Radican also states that "anyone having a valid amateur-radio license issued by another country can apply for permission to operate..." Wrong! Only amateurs from America, Germany, Finland, and Ireland can do that.

Cdr. Radican states that all a foreigner has to do is to take the written Japanese exam, and if he passes it, he will get a license and callsign like everyone else. Wrong again! He will get only an operator's permit. The station and operator's license are separate in Japan. He still needs a friendly Japanese who is willing to lend a club callsign to him. But no callsign will be assigned to the foreigner. The club callsign is owned by the Japanese, and the Japanese is in charge. The foreigner only becomes a member of that particular club. Under Japanese law, only Japanese citizens can have a callsign. Four non-Japanese have taken the Japanese test and passed, but they still had to search for a club to operate from.

Cdr. Radican disagrees with the statement that in Japan amateur radio is an extension of the Citizens Band. OK, he can disagree if he likes. But that doesn't change anything. He ought to listen to 2 meters or 15 meters some night or weekend. Maybe he would enjoy the sex tapes played on the main calling channel, deliberate repeater blocking, another "ham" telling all who will listen that he is going to masturbate on the air as he goes through all the sounds, the jeers and mocking when two English speakers want to have a QSO, guitar playing, singing, etc. Does Cdr. Radican have his head buried in the sand?

Cdr. Radican refers to the Japanese Denwakyu (whom I properly called "Novice" operators, in English). There is no doubt that the Novice operators in Japan have in the long run added new numbers to the ham population, but perhaps Cdr. Radican does not know that 42% of these new operators fail to renew their station licenses upon expiration. Of those that do renew, upon the second expiration, ony 25% renew. After that, the rate continues downward. It is a case of diminishing returns. We have just a lot of people "passing through" the amateur gates and never returning after they tire of screaming and shouting and carrying on. The reason? No incentive. One can remain in the depths of the Novice world forever if he or she so chooses. Too easy to get in in the first place. Remember that anything acquired too easily is usually not cherished for long. Incidentally, many people think the large number of hams here has some real meaning, but actually, callsigns are never reissued; counting callsigns is futile, since many operators are counted who have long ago dropped out. No one knows for sure what the real number is.

Technical skills superior to the US Novice? Yes, the questions do seem on a higher level, but remember that they are multiple choice. Memory courses are run for these budding hams the year around.

I think Cdr. Radican is correct in his statement about the new 900-MHz sport band. It is a good idea. But I am not planning to cover it, as it is outside the realm of ham radio.

Now about the US military KA stations. I covered this in the October issue of 73. Cdr. Radican seems to think that Japan and America have an agreement permitting these stations to operate. Quite the contrary. The JARL and Ministry of Posts have made it known to Japanese hams that KA stations are not hams at all and have prohibited all Japanese hams from contacting them, subject to penalties. The agreement that seems to be confusing Cdr. Radican is the Status of Forces Agreement that allows the US military to establish military communications. It is for that reason that Japan considers KA stations to be military rather than ham stations. It is not a kind Japanese government that is permitting the American KA stations full-band operation, even for US Novices. Quite the contrary.

Cdr. Radican thinks that ham radio should transcend politics. No, not when it comes to reciprocity, unfortunately. This is the real world.

Cdr. Radican states that "Nothing in Japan is easy. It is a bureaucratic, red-tape, paperwork nightmare. It also makes for full employment!" So, from that statement, I gather that Cdr. Radican would have the US imitate Japan in this regard: more red-tape and paperwork nightmares, and we will have full employment. How simple life could be, indeed! It isn't possible that some of that red tape and bureaucracy is keeping American products out of Japan, is it?

Cdr. Radican reminds me that "Japan is not America." Yes, I've noticed.

Cdr. Radican mostly objects to the voicing of my opinions of the policies of the Japanese government. Why is that? Are we to be afraid of the truth in these matters? Are my comments irrelevant to amateur radio? They certainly are not. Mr. Nakasone, the Prime Minister of Japan, does not deny me my right to criticize the government. I have written two times to Mr. Nakasone and received replies from him both times. (He answers all of his mail.) I am a member of Japanese society here, pay my taxes (heavily!), and obey the laws. Of course, I complain, and I shall continue to do so. I praise many things here, too.

My comments about Japanese life, etc., are known as "perspective sketching," and it's useful to set things in proper perspective in order to understand why things are like they are. We must not hide from the truth. I will continue to tell the truth as long as I have the strength to do so.

Cdr. Radican tells us about the various classes of Japanese licenses, etc., but we know all of that already. I hope Cdr. Radican will read the September and October issues of 73 for a fuller understanding.

Those of my Japanese friends who have read my columns so far have congratulated me on "telling the full story," as they put it. They are looking forward to a reciprocal agreement with the US as much as I am.

I enjoyed reading Cdr. Radican's letter. I just wish he would get his facts straight and put a little more trust in me. Any column I submit to 73 has been checked and double-checked carefully before submission. Items relating to law were confirmed by one of the 12 Japanese (English-speaking) attorney colleagues in my office. Additionally, these columns have been read by a Japanese and an American ham for "reaction" before submission to 73. I feel I owe that much to the readers of 73 and to Mr. Green. I am not infallible, of course, but in rereading the columns I have submitted to 73 thus far, I find no errors. The columns stand. Cdr. Radican has struck out.

As for that "unnameable" magazine, all I can say is that my mother stopped dishing up pablum when I was one year old. Thereafter, I haven't cared much for it.

I am sorry Cdr. Radican didn't like my August column in 73. (Surely he won't care much for my September and October columns either.) Many people did like the columns, however, judging by my mail so far. Even my Japanese in-laws and my Japanese nephew (a budding ham) enjoyed the columns. Cdr. Radican's letter is the only negative voice I have heard.

I hope Cdr. Radican will continue reading 73 even though he doesn't find my writing to his liking. There is a large selection of fine features in 73 every month, and I think he will find many interesting articles among them, perhaps more suited to his taste.—Roy E. Waite W9PQN, Tokyo, Japan.

ELECTRONIC LUNCH

If you go to a fast-service diner, order a *radio* for lunch. Short-order cooks call poached eggs on toast *Adam and Eve on a Raft*, sometimes served with *red lead* (ketchup).

A *radio* is a tuna-fish sandwich on toast. Does anyone know why?

Carl S. Zelich AA4MI
Merritt Island FL

RELOCATED BEACON

Thank you for publishing the information on my ten-meter beacon. Unfortunately, due to the lead time for publication, the information was published after I moved. The KA1YE/B beacon has been moved to the Rochester NY area in western New York. It is about 10 miles south of the city at 43° 02' N, 77° 41' W, in grid square FN 13 of the Maidenhead grid locator system. The power is still 4 Watts, and the antenna is a dipole. The beacon is on 24 hours a day on 28.286 MHz CW.

W. Kaith Hibbert KA1YE
527 Rush-Scottsville Rd.
Rush NY 14543
(716)-533-1389

DR. DIGITAL

Robert Swirsky AF2M
412 Arbuckle Avenue
Cedarhurst NY 11516

R. I. P., OSBORNE 1

I can still remember a QSO I had in April of 1981. There used to be a group of local hams that chewed the rag on 15 meters all night long. As usual, we were talking about computers.

The latest issue of *Byte* had just come out which, second only to receiving one's issue of *Kilobaud* (now *Microcomputing*), was the most interesting event in a computer hacker's life. (Hackers tend to lead dull lives.) In the editorial section, there was mention of a new computer: the Osborne 1. I commented to the guys in the net: "Did you see the new computer from Osborne? It certainly is an interesting idea!"

"Bob, I can't believe you fell for that," commented Marc WB2JUF. "That thing is nothing more than an April Fool's joke!" Everyone on frequency had a good laugh, and I conceded to Marc that I had been taken. After taking a close look at the picture of the Osborne 1, it looked as if it were a paste-up. And the silly things *Byte* said about it! Who in their right mind would want to put a computer under an airline seat?

After a few days passed and the *Wall Street Journal* carried a story on the unit, it became apparent that it was Marc, not me, who had been fooled. By now everyone knows the Osborne story. For a while they were extremely successful. The design which could have been taken for an April Fool's joke became a popular style of computer: the "transportable computer."

Unfortunately, Osborne didn't last. They announced their bankruptcy in late 1983. Competition became fierce, and mistakes were made and not corrected until it was too late. The death of Osborne also marked the end of another phenomenon: the "garage" computer. Now, with the big guns making personal computers, multimillion-dollar ad campaigns, and consumers looking for brand names when they go computer shopping, it will be next to impossible for an individual to start his or her own computer business. The shake-out has begun.

WAKE UP, IT'S 1984

We finally made it to Orwell's infamous year. Will technology help us or ruin us? As computer hobbyists, we all have encountered anti-computer remarks and no doubt have been offended by them. How many times have you been told by a shop clerk that the computer "won't let" her do something. Or perhaps you experienced a delay at the

```
1 SOUND 1,0,0,0
2 SOUND 0,0,0,0
3 SOUND 2,0,0,0
4 SOUND 3,0,0,0
10 READ A,B
11 IF A < 0 THEN 400
20 HT = 894895 - A * 7
30 HT = HT / A
40 HT = INT (HT + 0.5)
50 LT = 894895 - B * 7
60 LT = LT / B
70 LT = INT (LT + 0.5)
100 HTH = INT (HT / 256)
110 HTL = HT - (HTH * 256)
120 LTH = INT (LT / 256)
130 LTL = LT - (LTH * 256)
200 POKE 53768,120
210 POKE 53762,HTH
220 POKE 53760,HTL
230 POKE 53766,LTH
240 POKE 53764,LTL
250 POKE 53763,230
260 POKE 53767,230
270 FOR T = 1 TO 125: NEXT T
290 POKE 53763,224:POKE 53767,224
300 GOTO 10
400 END
1000 REM : DATA STATEMENTS HERE
1010 REM : LOW TONE, HIGH TONE
9999 DATA -1,-1
```

Program listing 1. Atari DTMF.

	697	770	852	941	1209	1336	1477	1633
1	X				X			
2	X					X		
3	X						X	
A	X							X
4		X			X			
5		X				X		
6		X					X	
B		X						X
7			X		X			
8			X			X		
9			X				X	
C			X					X
*				X	X			
0				X		X		
#				X			X	
D				X				X

Fig. 1. DTMF frequencies in Hz. Xs indicate tones for the digits and characters on the left

bank because "the computer was down." It's no wonder that some people seem to be against new technology. Amateur radio seems to be no different. I have received all sorts of strange comments from hams who object to the "strange noises" they hear coming from my station over two meters. Usually the objection is that the simplex frequency I am on (144.44) is for voice communications only, established by a gentlemen's agreement. To their comments, I can only respond that I am not a gentleman!

But by and large, hams are realizing that, in order to keep up with the world, a knowledge of computers is essential. In fact, computers are discussed over ham radio almost as much as the weather. I hope this trend continues.

One of the new things that computers have allowed is packet repeaters. Interest in this mode is gaining. It is nice to be able to use our spectrum more efficiently. Combined with mailbox facilities, a packet repeater is an excellent mode of communication. In the St. Louis area, packet radio is thriving. Pete Eaton WB9FLW, president of St. Louis Area Packet Radio, reports that "packet radio is growing rapidly . . . in the Midwest, as well as the rest of the country." His club publishes an informative newsletter, *SLAPR Protocol*. For more information about the club and the newsletter, write to: *SLAPR Protocol*, St. Louis Area Packet Radio Club, 1309 Gloucester Dr., Edwardsville IL 62025.

ATARI DTMF

Atari home computers incorporate a built-in sound synthesizer. With commands from Basic, it is possible to make a wide range of musical notes and weird noises. As the tones are specified with an 8-bit (0–255) quantity, resolution is limited. For applications which require an accurate tone, a higher resolution is required. Atari realized that there might be a need for accurate tones and provided a way of creating them.

Atari sound is generated with a custom chip known as POKEY. Normally, one controls sound production from Basic using SOUND commands of the form SOUND a,b,c,d where a is the voice (1–4), b is the pitch (0–255), c is the distortion parameter, and d is the amplitude (0–15). The POKEY chip, however, serves other functions and has other capabilities which are not directly accessible with Basic statements. These functions can be used from Basic with the help of some POKE commands.

The program in listing 1 will generate the tones for DTMF signaling. Program logic is as follows: lines 1–4 serve to initialize the POKEY chip. All sound generation in the program is done with POKE statements, not SOUND statements. Lines 10 through 130 read in a pair of tone frequencies. From these numbers, a value is calculated which corresponds to a 16-bit integer. These numbers are split into two segments; since a byte can only hold 8 bits, 2 bytes are needed to hold the 16-bit number. The statement in line 200 tells the POKEY chip to link the sound generators in pairs: 0/1 and 2/3. Each pair becomes 1 voice that is controlled by a 16-bit (0–65535) number instead of an 8-bit (0–255) number. In addition, this POKE also makes the POKEY switch to a higher clock frequency, thus providing even more accuracy. The tones are actually switched on by lines 250 and 260. After a short delay provided by the FOR/NEXT in line 270, the tones are switched off at line 290. Line 300 starts the process all over again.

To enter the tone data, the frequencies must be placed on data statements. For example, if you wanted to have the computer "dial" the code *911, add the following data statements:

1500 DATA 941,1209
1510 DATA 770,1477
1520 DATA 697,1209
1530 DATA 697,1209

Those numbers are, of course, the tone frequencies used in the DTMF code (see Fig. 1 for the complete code).

This program can be used to create any tone that you may need. Accuracy is certainly good enough for any amateur-radio purpose. Simply put the tone frequencies you want generated on data statements. To generate single tones, eliminate the following lines: 50, 60, 70, 120, 130, 230, 240, and 260. Change line 10 to "READ A" and line 290 to "POKE 53763,224" And, of course, create your data statements accordingly. It should be possible to generate accurate RTTY and SSTV tones with the Atari—perhaps even to take a graphics screen and convert it into the proper SSTV tones. (Basic would be too slow for this; assembly language would be needed.)

For those of you who want to experiment with Atari sound, memory locations 53761, 53763, 53765, and 53767 will be of interest to you; they are the audio-channel control registers. The most-significant three bits determine the distortion parameter, the next bit is the "forced-output" bit, and the least-significant three bits are the volume-level bits. When the forced-output bit is set to a one, the output is controlled directly with the volume bit; the speaker can be set to any one of 16 positions. Using this bit, custom waveforms can be created.

Frequency is determined with locations 53760, 53762, 53764, and 53766. The value in these registers controls the frequency of the corresponding audio generator. When two voices are linked together, the locations are taken in pairs with the higher address taking the most-significant portion of the 16-bit number.

The way to coordinate tone generation is with location 53768. For our purposes, we would be concerned with bits 6, 5, 4, and 3. When bit 6 is set to 1, channel 1 is clocked with a 1.79-MHz frequency; bit 5 does the same for channel 3. Setting bit 4 high will join channels 2 and 1; bit 3 joins channels 4 and 3. These addresses were used to produce the tones for the DTMF routine. As you see, the Atari will allow for some elaborate tone generation.

I certainly appreciate all the mail I have been receiving. So far, I have received a few interesting proposals for an amateur-radio graphics standard—I would like to hear from some more of you on this matter!

HAM HELP

I am converting a Teaberry Ranger T model 4012 CB rig for use on 10 meters. Can anyone supply a schematic or service manual?

T. Sherwood WB8QGB
PSC Box 4852
SJAFB NC 27531

I need manuals and schematics for the Yaesu YO-301 monitor scope and the Fire Bird F-200-M linear amplifier.

Mario Biedoeg
PO Box 560343
Suralco Dept. 53
Miami FL 33156

I need the manual (or a copy of it) for the Hallicrafters SR-500.

Doug Fonville
3805 33rd Street
Lubbock TX 79410

Wanted: Two YD844-A desk microphones for Yaesu radios.

John R. Bell KA9JYZ
3500-12th St.
East Moline IL 61244

I need the following coils for a National SW3 receiver: 31A (20 meters); 33A (40 meters); and coil 32. I also need National XR6 coil forms and winding information.

Walt Hill NM6L
Rt. 2, Box 323 Aliso Circle
Bishop CA 93514

Wanted: schematic and manual for the Motorola model L43GGB-1110A. I would also like to hear from anyone who has converted this set to two meters.

Ben Irvine N3CNH
Box 653 Blue Church Rd.
Coopersburg PA 18036

HAM HELP

Geloso (Italy) general-coverage (.5-30 MHz) receiver, model no. G.4/218 using 9 tubes—would anyone out there have a schematic?

Maverick 6m filter, 5-section adjustable, by Gavin Instruments, Somerville NJ—I need adjustment information on this TVI filter.

I will gladly pay postage and copying costs.

John Sehring WB2EQG
PO Box 236
Oakland NJ 07436

I would like to correspond with anyone who has converted a Bunker-Ramo Telequote MDS-7 or 2210 series computer I/O station to some practical use, e.g., oscilloscope, RTTY monitor, etc. I also need schematics for the Hewlett-Packard 400A ac VTVM, and Hal Communications 2550 keyer. I was also told that the circuit board has provisions for adding a memory function and would like information on this, if so.

Barry Fuerst
218 Flournoy St.
Oak Park IL 60304

I am looking for a manual for the CIR Astro-200 and a parts list for the Edgecom System 3000A.

Jim Fyles WB0CZI
820 El Paso Blvd.
Denver CO 80221

I would like to contact someone who knows how to convert the computer programs for the TRS-80 which have appeared in *73* into programs for the Commodore 64. I also need schematics for an Ampex stero amp: ASR 100, catalog #772-0056-01, s/n #5200445.

All copying and postage will be paid, but please notify me of costs in advance.

DuWain Brundage
2316B Little Valley Ct.
Birmingham AL 35218

I need manuals and schematics for the Hammarlund SP #600, the National NC #400, and the Collins R 390/URR (TM-0967-063-2010). I will pay for copying and postage.

Raul L. Martinez KA4UAT
PO Boc 44-1707
Miami FL 33144

I am looking for a service manual for the Panalyzer SB3 model T-200 panoramic adapter.

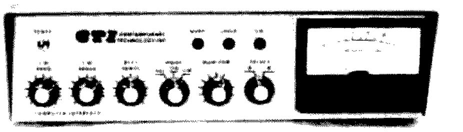
Keats A. Pullen W3QOM
2807 Jerusalem Road
Kingsville MD 21087

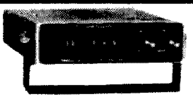
I would like to hear from anyone who can help me interface my VIC-20 to the Icom 720 transceiver. I would like to use the VIC-20 as a frequency controller and scanner.

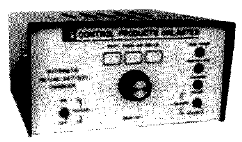
Robert F. Cann W4GBB
1606 Lochwood Dr.
Richmond VA 23233

I am looking for information on how to install disco lighting in stereo speakers.

Francis Turcotte
601 N. Tibbs
Indianapolis IN 46222







✓ See List of Advertisers on page 114

FCC

Reprinted from the Federal Register

Amendment of the Commission's Rules To Allow the Use of Volunteers To Prepare and Administer Operator Examinations in the Amateur Radio Service

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: This document amends FCC Rules to permit the use of Volunteers to prepare and administer amateur radio operator examinations. These amendments are necessary in order to maintain a viable examination program for amateur radio operators in light of FCC budgetary constraints. With a volunteer examination program, applicants will have more opportunities available to them to obtain amateur radio operator licenses.

EFFECTIVE DATE: December 1, 1983.

PART 0—[AMENDED]

1. The Table of Contents for Part 0 is amended as follows:

(a) A new § 0.484 entitled "Amateur radio operator examinations." is added.

(b) The Heading of § 0.485 is revised to read: "Commercial radio operator examinations."

* * * * *

2. A new § 0.484 is added to read:

§ 0.484 Amateur radio operator examinations.

Generally, examinations for amateur radio operator licenses shall be administered at locations and times specified by volunteer examiners. (See § 97.28(a)). When the FCC conducts examinations for amateur radio operator licenses, they shall take place at locations and times designated by the FCC.

3. Section 0.485 is revised to read:

§ 0.485 Commercial radio operator examinations.

Written examinations and International Morse code telegraphy examinations for commercial radio operator licenses are conducted at prescribed intervals or by appointment at locations specified in the Commission's current examination schedule, copies of which are available from any Commission field office or from the FCC, Public Service Division, Field Operations Bureau, FCC, Washington, D.C. 20554.

PART 1—[AMENDED]

4. The Table of Contents for Part 1 is amended as follows: the heading of § 1.925 is revised to read "Application for special temporary authorization, temporary permit or temporary operating authority."

5. Paragraph (a) of § 1.912 is revised to read:

§ 1.912 Where applications are to be filed.

(a) Applications for any class of new or upgraded amateur operator license shall be submitted to the examiners prior to the examination. (See § 97.28.) The examiners are required to submit the applications of persons passing their respective examinations to the Commission (for Novice Class operator licenses) or to the Volunteer-Examiner Coordinator (for all other amateur operator licenses). All other applications for amateur radio licenses shall be submitted to the Federal Communications Commission, Gettysburg, Pennsylvania 17325. Only one copy of the application is required.

* * * * *

6. The heading and paragraph (e) of § 1.925 are revised to read:

§ 1.925 Application for special temporary authorization, temporary permit or temporary operating authority.

* * * * *

(e) Upon successful completion of an Amateur Radio Service operator examination, an applicant already licensed in the Amateur Radio Service may operate his/her amateur radio station pending issuance of his/her permanent amateur station and operator licenses by the Commission for a period of 90 days or until issuance of the permanent operator and station licenses, whichever comes first, consistent with the rights and privileges of the higher operating class for which the applicant has passed the appropriate examination element(s), provided that the applicant retains the certificate(s) issued by the examiners for successful completion of the examination element(s) at the station location, and provided that the applicant uses an identifier code provided by a VEC as a suffix to his/her present call sign.

* * * * *

7. Section 1.934 is revised to read:

§ 1.934 Procedure with respect to amateur radio operator license.

Each candidate for an amateur radio license which requires the applicant to pass one or more examination elements must present the examiner(s) with a properly completed FCC Form 610 prior to the examination. Upon completion of the examination, the examiner(s) will immediately grade the test papers. If the applicant is successful, the examiner(s) will forward the candidate's application to: (a) the Commission's Gettysburg, Pennsylvania facility for an application for a Novice Class operator license, or (b) a Volunteer-Examiner Coordinator (VEC) for all other classes of operator licenses. The examiners will then issue a certificate for successful completion of an amateur radio operator examination. A VEC will forward the application to the Commission's Gettysburg, Pennsylvania facility.

PART 97—[AMENDED]

8. The Table of Contents for Part 97 is amended as follows:

(a) A new § 97.26 entitled "Examination procedure." is added.

(b) The heading of § 97.27 is revised to read "Examination preparation."

(c) The heading of § 97.28 is revised to read "Examination administration."

(d) A new § 97.29 entitled "Examination grading." is added.

(e) The heading of § 97.31 is revised to read "Volunteer examiner requirements."

(f) Section 97.32 and its heading are removed.

(g) The heading of § 97.33 is revised to read "Volunteer examiner conduct."

(h) A new § 97.35 entitled "Temporary operating authority." is added.

(i) A new Subpart I is added, as follows:

Subpart I—Volunteer-Examiner Coordinators

General

§ 97.501 Purpose.
§ 97.503 Definitions.
§ 97.505 Applicability of rules.
§ 97.507 VEC Qualifications.
§ 97.509 Conflicts of interest.

Volunteer-Examiner Coordinator Functions

§ 97.511 Agreement required
§ 97.513 Scheduling of examinations.
§ 97.515 Coordinating volunteer examiners.
§ 97.517 Written examinations.
§ 97.519 Examination procedures.
§ 97.521 Evaluation of questions.
§ 97.523 Identification of applicants passing examinations.

Authority: Secs. 4(i) and 303 of the Communications Act of 1934, as amended, 47 USC 154(i) and 303.

9. Section 97.11 is revised to read:

§ 97.11 Application for operator license.

(a) An application (FCC Form 610) for a new operator license, including an application for change in operating privileges, which will require an examination shall be submitted in accordance with the provisions of § 97.28.

(b) An application (FCC Form 610) for renewal and/or modification of license when no change in operating privileges is involved shall be submitted to the Commission's office at Gettysburg, Pennsylvania 17325.

10. Paragraph (b) of § 97.25 is revised to read as follows:

§ 97.25 Examination credit.

* * * * *

(b) A certificate of successful completion of an examination will be issued to applicants who successfully complete an examination element. Upon presentation of this certificate for telegraphy examination elements 1(A), 1(B) or 1(C), examiners shall give the applicant for an amateur radio operator license examination credit for the code speed associated with the previously completed element. For purposes of examination credit, this certificate is valid for a period of one year from the date of its issuance.

* * * * *

11. A new § 97.26 is added to read:

§ 97.26 Examination procedure.

(a) Each examination for an amateur radio operator license shall be administered at a location and a time specified by the examiner(s). Public announcement before examinations shall be made for elements 1(B), 1(C), 3, 4(A) and 4(B).

(b) The examiner(s) must be present and observing the candidate throughout the entire examination.

(c) The examiner(s) will be responsible for the proper conduct and necessary supervision during each examination.

(d) Each candidate for an amateur radio license, which requires the applicant to pass one or more examination elements, must present the examiner(s) with a properly completed FCC Form 610 on or before the registration deadline date for those examination sessions for which registration is required; otherwise, applicants shall submit FCC Form 610 at the examination session before the start of the examination(s). In cases where a registration deadline is required, it shall be specified by the VEC that issues the examination papers to the examiner.

(e) The candidate shall comply with the instructions given by the examiner(s). The examiner(s) must immediately terminate the examination upon failure of the candidate to comply with the examiner(s)' instructions.

(f) At the completion of the examination, the candidate shall return all test papers to the examiner(s).

(g) A candidate whose physical disabilities require special procedures to allow participation in examination sessions shall attach a statement to his/her application. For examinations other than Novice Class the statement shall be retained in the files of the VEC that issues the test papers. The statement for Novice Class examinations shall be retained by the examiner for one year. The statement shall include:

(1) A physician's certification indicating the nature of the disability; and

(2) the name(s) of the person(s) taking and transcribing the applicant's dictation of test questions and answers, if such a procedure is necessary.

(h) An applicant who fails an examination element required for an amateur radio operator license shall not apply to be examined for the same or higher examination element within thirty days of the date the examination element was failed.

12. Section 97.27 is revised to read:

§ 97.27 Examination preparation.

(a) Element 1(A) shall be prepared by the examiner. The preparer must hold an Amateur Extra, Advanced, or General Class operator license. The test shall be such as to prove the applicant's ability to transmit correctly by hand key and to receive correctly by ear texts in the international Morse code at a rate of not less than five (5) words per minute. (Special procedures may be employed in cases of physical disability. See § 97.26(g).) The applicant is responsible for knowing, and may be tested on, the twenty-six letters of the alphabet, the numerals 0-9, the period, the comma, the question mark, AR, SK, BT and DN. (See § 97.29(c).)

(b) Elements 1(B) and 1(C) shall be prepared by the examiners or be obtained by the examiners from the VEC. The preparer must hold an Amateur Extra Class license. The test shall be such as to prove the applicant's ability to transmit correctly by hand key and to receive correctly by ear texts in the international Morse code at not less than the prescribed speed. (Special procedures may be employed in cases of physical disability. See § 97.26(g).) The applicant is responsible for knowing, and may be tested on, the twenty-six letters of the alphabet, the numerals 0-9, the period, the comma, the question mark, $\overline{AR}$, $\overline{SK}$, $\overline{BT}$ and $\overline{DN}$. (See § 97.29(c).)

(c) Element 2 shall be designed by the examiner from PR Bulletin 1035A (latest date of issue), entitled *Questions for the Element 2 Amateur Radio Operator License Examination.*

(d) Elements 3, 4(A) and 4(B) will be designed by the FCC. The FCC will select questions for each test from the appropriate list of questions approved by the Commission (either PR Bulletin 1035 B, C, or D, latest date of issue). The FCC will provide each VEC with current examination designs. The VEC is required to hold current examination designs in confidence.

(e) PR Bulletins 1035 A, B, and C and D will be composed of questions originated by the FCC and questions submitted by amateur radio operators in accordance with the instructions in the Bulletin. Amateur radio operators holding Amateur Extra Class licenses may submit questions for any written examination element. Amateur radio operators holding Advanced Class licenses may only submit questions for Element 2 and 3. Amateur radio operators holding General Class or Technician Class licenses may only submit questions for Element 2.

13. Section 97.28 is revised to read:

§ 97.28 Examination administration.

(a) Unless otherwise prescribed by the Commission, each examination for an amateur radio operator license (except the Novice Class operator license) shall be administered by three accredited volunteer examiners. The examiners must hold Amateur Extra Class operator licenses, unless: (1) They are administering telegraphy element 1(A), in which case they may hold Amateur Extra Class, advanced Class or General Class radio operator licenses, or (2) they are administering written examination *elements 2 or 3, in which case they may*

hold Amateur Extra Class or Advanced Class radio operator licenses.

(b) Unless otherwise prescribed by the Commission, each examination for the Novice Class operator license shall be administered by one volunteer examiner. The examiner does not have to be accredited. The volunteer examiner must hold a current General, Advanced or Amateur Extra Class operator license issued by the Commission.

(c) Upon completion of an examination element, the examiner(s) shall immediately grade the test papers.

(d) When the candidate does not score a passing grade on an examination element, the examiner(s) shall so inform the candidate by providing the percentage of questions answered correctly, and by returning the application (see § 97.26) to the candidate. For examinations other than Novice Class examinations, the test papers, including answer sheets, shall be returned to the VEC that issued them. For Novice Class examinations, the test papers, including answer sheets, must be retained as part of the volunteer examiner's station records for one year from the date the examination is administered.

(e) When the candidate scores a passing grade on an examination element, the examiners (except for examinations for the Novice Class operator license) must issue a certificate of successful completion of the examination. This certificate must bear the VEC-issued examination identifier code (see § 97.523). This certificate is required for already-licensed applicants operating with privileges of an amateur operator class higher than that of their permanent amateur operator license (See §§ 1.925(e) and 97.84). Within one year this certificate may also be used for examination credit for elements 1(A), 1(B) or 1(C) (See § 97.25).

(f) When the candidate scores a passing grade on all examination elements required for the operator license class sought (see § 97.23), the examiners shall certify to the following information on the candidate's application form (see § 97.26):

(1) Examiners' names, addresses and amateur radio station call signs;

(2) Examiners' qualifications to administer the examination (see § 97.31); *and*

(3) Examiners' signed statements that the applicant has passed the required examination elements.

(g) Within ten days of the administration of a successful examination for the Novice Class operator license, the examiner shall submit the candidate's application to: Federal Communications Commission, Gettysburg, Pennsylvania 17325.

(h) Within ten days of the administration of a successful examination for the Technician, General, Advanced or Amateur Extra Class operator license, the examiners shall submit the successful candidates' applications and all test papers to the VEC that originally issued that test.

(i) The FCC reserves the right, without qualification, to:

(1) administer examinations itself; *or*

(2) readminister examinations itself or under the supervision of an examiner designated by the FCC, to any person who obtained an operator license through the volunteer examination process.

14. A new § 97.29 is added to read:

§ 97.29 Examination grading.

(a) Each examination element shall be graded separately by the examiners.

(b) An applicant passes a written examination if he/she answers at least 74 percent of the questions correctly.

(c) An applicant passes a code element examination if he/she proves his/her ability to transmit correctly by hand key (straight key, or, if supplied by the applicant, any other type of hand operated key such as a semi-automatic or electronic key, but not a keyboard keyer) and to receive correctly by ear texts in the international Morse code at not less than the prescribed speed for one continuous minute during a five-minute test period. Each five characters shall be counted as one word. Each punctuation mark and numeral shall be counted as two characters.

15. Section 97.31 is revised to read:

§ 97.31 Volunteer examiner requirements.

(a) Each volunteer examiner administering an examination for an amateur radio operator license must:

(1) Be at least 18 years of age; *and*

(2) Not be related to the candidate.

(b) Any person who owns a significant interest in, or is an employee of, any company or other entity which is engaged in the manufacture or distribution of equipment used in connection with amateur radio transmissions, or in the preparation or distribution of any publication used in preparation for obtaining amateur station operator licenses, is ineligible to be a volunteer examiner for purposes of administering an amateur radio operator examination. However, an employee who can demonstrate that he/she does not normally communicate with that part of an entity engaged in such manufacture or publishing is eligible to be a volunteer examiner.

(c) Each volunteer examiner shall be uncompensated for his/her services.

(d) Each volunteer administering an examination for the Technician, General, Advanced or Amateur Extra Class operator license must be accredited by the Volunteer-Examiner Coordinator (see Subpart I).

(e) The FCC will not accept the services of any person seeking to be a volunteer examiner if that person's amateur radio station license or amateur radio station operator's license has ever been revoked or suspended.

16. Section 97.33 is revised to read:

§ 97.33 Volunteer examiner conduct.

A volunteer examiner who has given or certified examinations fraudulently or for monetary or other consideration is subject to revocation of his/her amateur radio station license and suspension of his/her amateur radio operator license.

17. A new § 97.35 is added to read:

§ 97.35 Temporary operating authority.

Upon successful completion of an Amateur Radio Service operator examination, an applicant already licensed in the Amateur Radio Service may operate his/her amateur radio station pending issuance of his/her permanent amateur station and operator licenses by the Commission for a period of 90 days or until issuance of the permanent operator and station licenses, whichever comes first, consistent with the rights and privileges of the higher operating class for which the applicant has passed the appropriate examination(s), provided that the applicant retains the certificate(s) issued by the examiners for successful completion of the examination(s) at the station location, and provided that the applicant uses an identifier code provided by a VEC as a suffix to his/her present call sign.

18. Paragraph (f) of § 97.84 is revised to read:

§ 97.84 Station identification.

* * * * *

(f) When operating under the temporary operating authority permitted by § 1.925(e) with privileges which exceed the privileges of the licensee's permanent operator license, the station must be identified in the following manner:

(1) On radiotelephony, by the transmission of the station call sign, followed by the word "temporary," followed by the identifier code(s) shown on the certificate(s) for successful completion of an amateur radio operator examination.

(2) On radiotelegraphy, by the transmission of the station call sign, followed by the fraction bar DN, followed by the identifier code(s) shown on the certificate(s) for successful completion of an amateur radio operator examination.

* * * * *

19. A new Subpart I is added to Part 97 to read as follows:

* * * * *

Subpart I—Volunteer-Examiner Coordinators

General

§ 97.501 Purpose.

The rules in this subpart are designed to provide for the establishment of volunteer-examiner coordinators to coordinate the efforts of volunteer examiners in preparing and administering examinations for amateur radio operator licenses.

§ 97.503 Definitions.

For the purpose of this subpart, the following definitions are applicable:

(a) *Volunteer-examiner coordinator* (VEC). An entity which has entered into an agreement with the Federal Communications Commission to coordinate the efforts of volunteer examiners in preparing and administering examinations for amateur radio operator licenses.

(b) *Volunteer examiner*. An amateur radio operator who prepares or administers examinations to applicants for amateur radio operator licenses (see § 97.30).

§ 97.505 Applicability of rules.

These rules apply to each entity that serves as a volunteer examiner coordinator.

§ 97.507 VEC Qualifications.

In order to be a VEC, an organization must:

(a) Be organized at least partially for the purpose of furthering amateur radio;

(b) Be at least regional in scope, serving one or more of the following regions:

(1) Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island and Vermont;

(2) New Jersey and New York;

(3) Delaware, the District of Columbia, Maryland and Pennsylvania;

(4) Alabama, Florida, Georgia, Kentucky, North Carolina, South Carolina, Tennessee and Virginia;

(5) Arkansas, Louisiana, Mississippi, New Mexico, Oklahoma and Texas;

(6) California;

(7) Arizona, Idaho, Montana, Nevada, Oregon, Utah, Washington and Wyoming;

(8) Michigan, Ohio and West Virginia;

(9) Illinois, Indiana and Wisconsin;

(10) Colorado, Iowa, Kansas, Minnesota, Missouri, Nebraska, North Dakota and South Dakota;

(11) Alaska;

(12) Caribbean Insular areas: Commonwealth of Puerto Rico, United States Virgin Islands (50 islets and cays) and Navassa Island; and

(13) Pacific Insular areas: Hawaii, American Samoa (seven islands), Baker Island, Commonwealth of Northern Mariana Islands, Guam Island, Howland Island, Jarvis Island, Johnston Island (Islets East, Johnston, North and Sand), Kingman Reef, Midway Island (Islets Eastern and Sand), Palmyra Island (more than 50 islets) and Wake Island (Islets Peale, Wake and Wilkes).

(c) Be capable of acting as a VEC in one or more of the regions listed in paragraph (b);

(d) Agree to coordinate all amateur radio operator examination elements for all amateur radio operator license classes;

(e) Agree not to accept any compensation from any source for its services as a VEC; *and*

(f) Agree to assure that for any examination every candidate qualified under these rules is registered without regard to race, sex, religion, national origin or membership (or lack thereof) in any amateur radio organization.

§ 97.509 Conflicts of interest.

An entity engaged in the manufacture or distribution of equipment used in connection with amateur radio transmissions, or in the preparation or distribution of any publication used in preparation for obtaining amateur radio station operator licenses may be a VEC only upon a persuasive showing to the Commission that preventive measures have been taken to preclude any possible conflict of interest.

Volunteer-Examiner Coordinator Functions

§ 97.511 Agreement required.

No entity may serve as a VEC until that entity has entered into a written agreement with the Federal Communications Commission to do so. The VEC must abide by the terms of that agreement.

§ 97.513 Scheduling of examinations.

A VEC will coordinate the dates and times for scheduling examinations (see § 97.26) throughout the areas where communications are regulated by the Federal Communications Commission. A VEC may also coordinate the scheduling of testing opportunities at other places. A VEC shall notify the Engineer-in-Charge of the Field Operations Bureau (FOB) District Office having jurisdiction over the area where an examination is to be held of the time, place and registration requirements for any examination. If no FOB District Office has jurisdiction over the area where an examination is to be held, a VEC shall notify the Chief of the Public Service Division of FOB in Washington, D.C., instead. In either case, this notification must be made at least 30 days in advance of the registration deadline.

§ 97.515 Coordinating volunteer examiners.

A VEC will accredit amateur radio operators, licensed by the Federal Communications Commission, as volunteer examiners (see § 97.30). A VEC will seek to recruit a broad representation of amateur radio operators to be volunteer examiners. A VEC may not discriminate in accrediting volunteer examiners on the basis of race, sex, religion or national origin. A VEC may not refuse to accredit a volunteer on the basis of membership (or lack thereof) in an amateur radio organization. A VEC must not accredit an amateur radio operator volunteering to be an examiner if:

(a) The volunteer examiner does not meet minimum statutory qualifications or minimum qualifications as prescribed by the rules;

(b) The FCC refuses to accept the voluntary and uncompensated services of the volunteer examiner;

(c) The VEC determines that the volunteer is not competent to perform the function for which he/she volunteered; *or*

(d) The VEC determines that questions of the volunteer's integrity or honesty could compromise the examination(s).

§ 97.517 Written examinations.

A VEC will assemble, print and distribute written examinations designed by the FCC (see § 97.27(d)).

§ 97.519 Examination procedures.

At the completion of each examination, a VEC will collect the candidates' application forms, answer sheets and test results from the volunteer examiners (see § 97.28(h)). A VEC will:

(a) Make a record of the date and place of the test; the names of the

volunteer examiners and their qualifications; the names of the candidates; the test results; and, related information.

(b) Screen the application for completeness and authenticity.

(c) Forward the application within ten days of the date of the most recent examination to: Federal Communications Commission, Licensing Division, Private Radio Bureau, Gettysburg, Pennsylvania 17325.

(d) Make available to any authorized FCC representative any requested examination records.

§ 97.521 Evaluation of questions.

A VEC will be expected to evaluate the clarity and accuracy of examination questions on the basis of experience, and to bring ambiguous or inaccurate questions to the attention of the Commission, with a recommendation on whether to revise the question or to delete the question from the Commission's list of examination questions.

§ 97.523 Identification of applicants passing examinations.

A VEC must establish a unique identifier code for each testing session. This code must be a slant (/) followed by two letters from one of the following letter groups: WA through WZ, KA through KZ, NA through NZ, or AA through AL. The identifier code must be shown on the certificate for successful completion of an examination. The identifier code(s) applicable must be appended as a suffix to the licensee's call sign when the licensee operates under temporary authority granted to amateur radio operators who have passed the appropriate examination(s) for a higher class (see §§ 1.925(e) and 97.84(f)).

Use of Volunteers To Prepare and Administer Operator Examinations in the Amateur Radio Service; Correction.

AGENCY: Federal Communication Commission.

ACTION: Final rule; correction

SUMMARY: This document corrects an FCC Rule regarding Volunteer-Examiner Coordinators (VEC's) in the Amateur Radio Service. This correction is necessary in order to clarify that VEC's will not be required to coordinate amateur radio operator examinations for the Novice Class.

FOR FURTHER INFORMATION CONTACT: John J. Borkowski, Private Radio Bureau, Washington, D.C. 20554 (202) 632-4964.

Erratum

In the matter of amendment of parts 0, 1 and 97 of the commission's rules to allow the use of volunteers to prepare and administer operator examinations in the Amateur Radio Service; PR Docket No. 83-27, Rm-4229.

Released: October 12, 1983.

1. On September 29, 1983, the Commission released a *Report and Order*, FCC 83-433, in the above captioned proceeding. In the *Report and Order*, the Commission amended Parts 0, 1 and 97 of its Rules to allow the use of volunteers to prepare and administer operator examinations in the Amateur Radio Service.

2. At paragraph 9 of the *Report and Order*, the Commission indicated that it was adopting new rules to apply above the Novice Class, while retaining rules recently adopted in another proceeding for the Novice Class. *See Report and Order*, PR Docket No. 82-727, 48 FR 32586 (July 18, 1983). However, paragraph (d) of newly added Section 97.507 of the Rules in the Appendix would appear to require Volunteer-Examiner Coordinators (VEC's) to coordinate examinations for all classes, including the Novice Class. This was not intended.

3. Accordingly, paragraph (d) of Section 97.507 of the Rules in the Appendix is corrected to read as follows:

§ 97.507 VEC Qualifications.

* * * * *

(d) Agree to coordinate all amateur radio operator examination elements for all amateur radio operator license classes except Novice Class;

* * * * *

Federal Communications Commission.
William J. Tricarico,
Secretary.

Amendment of the Rules To Authorize Ten Year License Terms in the Amateur Radio Service

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: The Commission is amending Part 97 of its Rules to authorize ten year operator and station license terms and two year grace period for renewal of expired operator and station licenses in the Amateur Radio Service. The Communications Amendment Act of 1982 authorized license terms not to exceed ten years in the Amateur Radio Service. This change is necessary in order to eliminate a burden on Commission resources and a paperwork burden upon the public.

DATES: Effective December 15, 1983.

PART 97—[AMENDED]

1. Section 97.13(d) is revised to read as follows:

§ 97.13 Renewal or modification of operator license.

* * * * *

(d) If a license is allowed to expire, application for renewal may be made during a grace period of two years after the expiration date. During this grace period, an expired license is not valid. A license renewed during the grace period will be dated currently and will not be backdated to the date of its expiration. Application for renewal shall be submitted on FCC Form 610 and shall be accompanied by the applicant's expired license or a photocopy thereof.

2. Section 97.47(b) is revised to read as follows:

§ 97.47 Renewal and/or modification of amateur station license.

* * * * *

(b) If a license is allowed to expire, application for renewal may be made during a grace period of two years after the expiration date. During this grace period, an expired license is not valid. A license renewal during the grace period will be dated currently and will not be backdated to the date of its expiration. An application for an individual station license shall be submitted on FCC Form 610. An application for an amateur club or military recreation station license shall be submitted on FCC Form 610-B. In every case the application shall be accompanied by the applicant's expired license or a photocopy thereof.

3. Section 97.59 (a) and (b) are revised to read as follows:

§ 97.59 License term.

(a) Amateur operator licenses are normally valid for a period of ten years from the date of issuance of a new, modified or renewed license.

(b) Amateur station licenses are normally valid for a period of ten years from the date of issuance of a new, modified or renewed license. All amateur station licenses, regardless of when issued, will expire on the same date as the licensee's amateur operator license.

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

DX AWARDS FROM CZECHOSLOVAKIA

If you've never seen the beautiful DX awards available to licensed amateurs from the Central Radio Club of Czechoslovakia, then you're in for a real treat. It has been my pleasure this past month to have received the full details of their entire awards program and they are described in the paragraphs to follow.

S6S Award

The S6S Award is afforded those amateurs who have had a QSO since January 1, 1950, with at least one station located in each of the six continents as defined by the IARU. Awards will recognize those contacts on CW, phone, and RTTY, either allband or single-band achievements. Mixed-mode contacts are recognized.

P75P Award

This award is for having worked at least 75 ITU zones as defined by the ITU Geneva Conference of 1959. All contacts must have been made since January 1, 1960, and awards are available in three levels of achievement: 1st class—70 zones, 2nd class—60 zones, and 3rd class—50 zones. Zones may be determined in accordance with a special map made available by the Central Radio Club for a cost of 3 IRCs. Also, it is important to note that all contacts must be made with fixed stations only.

ZMT Award

To qualify for the ZMT Award, applicants must have confirmed contact since April 26, 1949, with at least one station located in each of the following 39 areas: OK1, OK2, OK3, HA, LZ, UA1, UA2, UA3, UA4, UA6, UA9, UA0, UB, UC, UD, UF, UG, UH, UI, UJ, UL, UM, UN, UO, UP, UQ, UR, DM (3 different regions determined by the last letter of the callsign), SP (3 different districts), YO (3 different districts), YU (3 different districts).

ZMT 24 Award

For those interested in pursuing the ultimate in DX endurance, the ZMT 24 Award is just for you. The requirements are exactly the same as for the basic ZMT Award detailed above, with the exception that all contacts must be made within a 24-hour period. Sound impossible? Absolutely not, but don't be discouraged if it takes you several attempts using the stopwatch!

100 OK Award

Check your QSL cards. If you can find a total of 100 OK stations, then you will qualify for the 100 OK Award. All contacts, however, must have been made on or after January 1, 1954. Endorsement stickers are available for every additional 100 stations confirmed, up to a total of 500. Stations may be worked any band, any mode.

OK SSB Award

This award requires the applicant to have two-way SSB contact with different Czechoslovak stations totaling 25 points, without a date limitation. 1 point will be scored for each QSO on the 28-, 21-, or 14-MHz bands and 2 points for each QSO on the 7- or 3.5-MHz bands. There are no mode restrictions.

As an added tip to those wishing to pursue these very respectable awards, this editor recommends that you keep a close eye on the "Contests" column in *73* magazine and consider making a few contacts during the annual OK DX Contest. Dates and times will be announced at least a month in advance of the scheduled event. The Awards Manager of the CRC also mentions that QSOs made during the contest will not require QSL confirmations. There is one stipulation, however: Application must be submitted along with your logbook entry for the OK DX Contest.

All the certificates are issued free of charge for members of clubs or associations which accept this rule reciprocally. The fee for all others is 10 IRCs for the P75P Award and 5 IRCs for all the other awards offered by the Central Radio Club of Czechoslovakia. General certification rules apply by which contacts may be verified by two amateurs of a local club, a club official, or a notary public.

Applications shall include details for each contact, i.e., callsign, GMT, date, frequency, mode, RS(T), and any additional information required for the award. Send to Central Radio Club, Awards Manager, PO Box 69, 113-27 Praha 1, Czechoslovakia.

Slovensko Award

The DX Club of Radio Amateurs of Slovakia offers this award to all licensed amateurs who can show proof of contact with stations in the different districts (OKR) of Slovakia (OK3, OL8, OL9, OL0; districts listed below) after January 1, 1946.

Stations in countries which have a common border with Slovakia must contact 35 districts, 20 districts are required of stations in other European countries, and 10 districts are required for stations outside the European continent.

There are no band or mode restrictions. Applications with a GCR list and award fee of 5 IRCs may be sent to: Central Radio Club, PO Box 69, 113-27 Praha 1, Czechoslovakia.

Districts which qualify are: Banska, Dystrica, Bardejov, Bratislava, Bratislava-Vidiek, Cadca, Dolny Kubin, Dunajska Streda, Galanta, Hmenne,

Komarno, Kosice, Kosice-Vidiek, Levice, Liptovsky, Mikulas, Lucenec, Martin, Michalovce, Nitra, Nove, Zamky, Poprad, Povazska Bystrica, Presov, Prievidza, Rimavska Sobota, Roznava, Senica, Spisska Nova Ves, Stara Lubovna, Svidnik, Topolcany, Trebisov, Trencin, Trnava, Velky Krtis, Vranov, Zvolen, Ziar nad Hronom, and Zilina.

TEN-TEN INTERNATIONAL NET AWARDS

For those of us who frequent the ten-meter band, a minute doesn't elapse that you don't hear reference being made to the Ten-Ten International fraternity.

The 10-10 organization was formed in 1962 by a group of amateurs in southern California. To this date, better than 27,000 amateurs have joined their ranks. The unique awards program for this international group was founded and managed for years by Frank Orcutt W4JO, who is now a silent key.

To qualify for membership in Ten-Ten International and to move up on their awards ladder of achievement, you first must make contact with ten individual Ten-Ten members on the ten-meter band. From each QSO, you must obtain the station's call, 10-10 number, name, and exact QTH. Once this has been achieved, you may submit your list along with your check for US$4.00 (includes fee for the quarterly 10-10 publication) to one of the following area or district vice presidents: Earle W1NC, Larry WA2SUH, Jim WA3RBQ, Clint K4EKX, Grace K5MRU, Dick W6ANK, Ron WB7ADO, Del W9BPU, John N0ADJ, Mac ZL3RK (New Zealand), Art VK2BXN (Australia), August DK5UG (Europe), Jim K6PJO (DX at large).

Your application is checked against the 10-10 net roster, and if found correct, you will be issued your very own 10-10 number and Black Cat Certificate.

Once you obtain your 10-10 number, you may begin work toward various "bar" awards. The bar awards are issued in multiples of 100 individual 10-10 contacts. To apply for any bar award, you must not duplicate contacts previously claimed. In each case, submit only 100 contacts per application—no more. Each must show the callsign of the station worked, the 10-10 number, name, and exact QTH.

Award applications must show contacts in 10-10 number sequence. Applications received in any other order will be returned. There is no award fee for "bars"; however, an SASE sent along with your application is appreciated. Send to: Bill Risher WB6OMH, 10542 Lock Avon Drive, Whittier CA 90606.

This same process is repeated for the 200, 300, and 400 bar awards. Where it will end, nobody knows, for the most numbers collected to date is by Grace K5MRU, who now has 8200 confirmed.

When you reach the 500 bar, serial numbers are then assigned to each bar issued thereafter. Once the applicant reaches 1000, he or she reaches the first step in which award plaques are issued. Plaques are issued also for 2500, 5000, and 7500 contacts.

10-10 WAS Award

This award requires an applicant to make at least one contact in each state with another member of Ten-Ten International. QSL cards and sufficient postage for their safe return are to be sent with your application to WB6OMH. This award is issued only for contacts made after January 1, 1973, on any authorized mode on the ten-meter band.

The VP Certificate

To qualify for this award, a net member must have earned his or her "500 bar," at which time a VP number and certificate were assigned. The idea for the VP certificate issued here is to work at least 100 other net members who have achieved their 500 bar and who have been issued a VP serial number. To be valid, all contacts must be made between 28.500 and 28.550 MHz or above 29 MHz, with the contact lasting at least 5 minutes. As with all 10-10 awards, application must indicate the 10-10 number, callsign, name, frequency, and exact QTH. Also, a definite requirement is to list the station's VP serial number.

All contacts must be made on or after October 15, 1979, to qualify. Send your application to: Grace Dunlap K5MRU, Box 445, La Feria TX 78559.

To the best of our knowledge there is no award fee.

Lucky 13 Award

The Lucky 13 Award is to prove that your station is capable of working the entire 10-meter band. This is not a frequency-measuring test and it is not necessary to stay exactly on the prescribed frequencies. The idea here is to make contact with 13 different VP members on each 100-kHz segment of the band: 28.500, 28.600, 28.700, 28.800, 28.900, 29.000, 29.100, 29.200, 29.300, 29.400, 29.500, 29.600, and 29.690 (29.700 is the band edge, so be careful). Any mode or mixed mode is permissible. As with all awards, you must log the callsign, the VP number, the first name, the QTH, and in this case, the date and time of each contact claimed. It is not necessary to send QSLs, but you should have your list verified and mailed to: Rich Richardson QB6FQD, 960 E. Cottonwood Avenue, Littleton CO 80121.

FEARL AWARDS

I received award information from a personal friend of mine, Glenn KA8GW (WB7SPD), who used to reside here on Whidbey Island and is stationed with the US Navy in Masawa, Japan. Glenn urges those seeking the awards being offered by the Far East Auxiliary Radio League (FEARL) to be careful to only count contacts with KA stations in Japan and not to include those in the continental United States.

Glenn mentioned a couple of nets which may assist those wishing to meet the award requirements in a minimum of time. 14.284 MHz is the golden frequency on Sundays at 0200Z and Wednesdays at 1200Z.

All FEARL awards are available for $1.00 or 7 IRCs, which must be sent with your application to: Far East Auxiliary Radio League, Attention: Awards Manager, c/o Sam Fleming KA2SF, GARH-ID-GS-M NCS Japan, APO San Francisco CA 96343.

Worked Fifteen KA Stations

To qualify for the WFTKAS Award, applicants must work a minimum of at least 15 KA stations located in Japan or Okinawa. Stateside KA stations do not count. There are no mode or band restrictions nor are there any date limitations. General certification rules apply, with proper logbook data.

KA Rag-Chewers Club

This award certifies that the applicant has presented evidence of having had a rag chew with a KA station in the Orient for a period of not less than thirty minutes. There are no band, mode, or date limitations. To apply, merely give general logbook data including the time your QSO began and ended. GCR apply.

Rag-Chewer Supreme

Should you be longwinded and were fortunate enough to enjoy an hour-long QSO with a KA station in the Orient, then the Rag-Chewer Supreme award is designed especially for you. To apply, merely provide logbook data and the appropriate award fee of $1.00 or 7 IRCs. GCR apply.

KA Roundtable Award

To qualify for this award, the applicant must establish and maintain two-way amateur-radio communication with at least two KA stations in the Orient on the same frequency at the same time for a minimum of thirty minutes. There are no special band or mode endorsements. Date is not a factor. GCR apply.

Shortwave Listener Award

For the shortwave listeners, FEARL presents this award for having heard and rendered a signal report to the operators of at least two KA stations in the Orient. Applicants merely send general logbook data and the appropriate award fee when applying.

UTICA NY

The Utica Amateur Radio Club will operate special-event station K2IQ, commemorating its 50th anniversary, from 1700Z February 11 to 2200Z February 12, on SSB, 25 kHz from the upper edge of the 40-, 20-, and 15-meter bands, and 25 kHz from the upper edge of the 40-meter Novice band. QSL with SASE and contact number for an attractive certificate to: K2IQ, PO Box 71, Utica NY 13503.

SNOWFLAKE MADNESS

The Michigan Technological University Amateur Radio Club and the Copper Country Radio Amateur Association announce a radio celebration of their Winter Carnival festivities in the northernmost part of Michigan's upper peninsula.

Tech's Winter Carnival is probably the most spectacular winter festival in America with snow sculptures, ice hockey, dogsled racing, skiing, and other festive events.

In association with the Copper Country Chamber of Commerce, we are issuing a certificate to all amateurs who make contact with any participating ham in the Copper Country between 0000 February 2 and 0000 February 8, 1984.

Only one contact is required to get a certificate. Frequencies are 3.630, 7.090, and 14.095, RTTY; 3.705, 7.085, 14.085, 21.085, and 28.185, CW; and 3.930, 7.285, 14.305, 21.385, and 28.685, phone. On CW listen for CQ Winter Carnival.

Send your QSL along with three 20¢ stamps (for postage and handling) to: Howard Junkin N8FHF, 106 W. South Avenue, Houghton MI 49931.

HOSARC SPECIAL-EVENT STATIONS

The Hall of Science Amateur Radio Club will issue a commemorative certificate to anyone working a HOSARC club station on January 15 from 1400 to 2300 UTC, in conjunction with HOSARC's 11th anniversary. Stations using the call WB2JSM will operate CW in the first 25 kHz of the Novice bands of 40, 15, and 10 meters. Stations using the call WB2ZZO will operate SSB in the first 25 kHz of the General phone bands of 40, 20, 15, and 10 meters. QSL with a large SASE (40¢ or 1 IRC) to HOSARC, PO Box 131, Jamaica NY 11415, or to WB2YXB, club QSL manager.

PUNXSUTAWNEY PA

The Punxsutawney, Pennsylvania, Amateur Radio Club will commemorate Groundhog Day on Sunday, January 29, 1984, from 10 am to 5 pm on 7.230 and 14.290. For a certificate send an SASE to Clif WB3GAD, RD #6 Box 211, Punxsutawney PA 15767.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

HAPPY NEW YEAR

The start of a new year brings reflection and anticipation: reflection on the events of the past twelve months and anticipation for the coming year. It is a time to think back on coveted successes and missed opportunities, a time to consider what you will be doing over the next year.

1983 was a good year for DX. Not a great one; the sunspot numbers continued to fall, shortening band openings and weakening signals. But 1983 also saw some excellent DX from many corners of the globe.

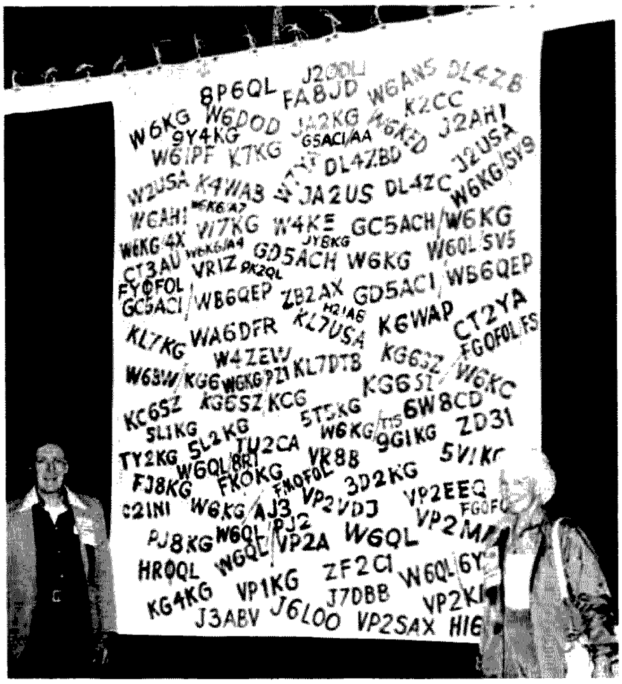
Among the DX highlights were not one but *two* DXpeditions to inhospitable Heard Island, the disaster in the Spratly Islands, a highly successful assault on Malpelo, increasing activity from China, and dozens of other amateur operations.

What do we see ahead for 1984? Radio propagation will continue to decline. The sunspot numbers are already well below their peak levels of the late '70s and early '80s, and they will fall still further this year. This regular pattern of worsening propagation is familiar to DXers of more than 10 years standing. The old-timers will remember the slow days of the mid-'70s when sporadic E and trans-equatorial propagation provided what little DX excitement there was, and DXing hours were spent fighting the static on the lower frequencies and calling long CQs on apparently dead bands.

1984 probably will not be the bottom of the current sunspot cycle. The 1986-8 period is a more likely candidate for that dubious honor. However, the sun can be fickle, and it can decrease activity dramatically or flare up and provide some good DXing. But the overall trend in 1984 will be down.

Those DXers bitten by the DX bug in the past few years, however, will be hard pressed. The tremendous increase in the number of amateurs worldwide and especially the number of DXers, since the last sunspot minimum, is unprecedented. Many thousands of amateurs turned on to DX at a time when 10 Watts into a wet noodle could be heard around the world. The amateur radio equipment of today is significantly advanced over that of ten years ago, facilitating such communications.

Jim Smith VK9NS plans a 1984 DXpedition to Kermadec Island, north of New Zealand. Jim led the Heard Island DX Association trip to Heard last year. (Photo via The DXers Magazine*)*



Lloyd W6KG and Iris W6QL Colvin swing through South America on the 1983-4 Yasme trip. (Photo via The DXers Magazine*)*

The effects of these factors of declining sunspots and large numbers of avid DXers can be seen already. When a DX station comes on the band, a pileup often begins even if the station is not particularly rare. The large number of DXer mice chasing the increasingly elusive DX cheese makes it very difficult for foreign stations to have satisfying contacts. This trend will only worsen.

For the many thousands of amateurs who have started chasing DX since 1978, 1984 will be a year of decision. Should I upgrade my station to remain competitive in the increasingly-difficult DX world? Should I try to tough it out with my present equipment, meekly accepting diminishing results? Or should I forget about DX for a few years and turn to satellite operation or stamp collecting?

The hard-core DXer will rise to the challenge, improving his station and operating techniques to ensure DX success. And the DXer will have considerable assistance in this task. Again in 1984, as in the past years, a number of hard-working and dedicated amateurs will be traveling to choice DX locations around the world to hand out contacts to the "Deserving DXers."

THE DX ADVENTURE

Some of the most rewarding aspects of DXing are the wonderful people who devote so much of their own time and money to sponsor, organize, and operate on DXpeditions to the rarer amateur spots in the world. Without the dedication and persistence of these amateurs, the DX world would be dull indeed. And a fine example of this respected breed is Jack Binder KB7NW.

An avid traveler, Jack had moved to Australia in 1969 with his English wife, Jude. A few years later, the Binder family, including two young sons, set sail in their home-built *Banyandah* (which is Aboriginal for "Home on the Water"). And that's what the yacht was to the family of four: their only home. For eight years the family cruised the Pacific, covering more than 60,000 miles. Jack and Jude took turns teaching their boys using materials from a cooperative stateside school. The parents supplemented the traditional curriculum with extra lessons in marine biology, botany, and geography, based on their travels.

The Binders kept their expenses to the minimum (there was no need of clothes on the boat or uninhabited islands, for example), but they did need a source of cash for foodstuffs, supplies, and repairs. Sometimes Jack worked on land for a short time, but in 1978 he turned to charter trips for income. And one of his early charters was a DXpedition to Mellish Reef, off Australia.

Jack's next DXpedition would be enough to turn most hams away from this pastime: Jack's yacht was fired upon as it approached Amboyna Cay, in the Spratly Islands, in 1979. The Binders escaped without being hit, unlike the Germans in the more recent attempt. Several members of that DXpedition figured Brunei VS5 was exciting enough, but Jack and two other hams returned to the Spratlys, setting up and operating on Barc Canada Reef. Since then, Jack's wanderlust and DX spirit have led him to Palmyra, Kingman, Tokelau, and back to Mellish Reef.

The Binders called a temporary halt to their odyssey in 1982 and placed their sons in a regular school for the first time in their lives. Meanwhile, Jack earned some much-needed funds by piloting a charter vessel around the Great Barrier Reef. "It's an unalterable fact of life that it costs money to live, no matter how idyllic the life-style or how basic and down-to-earth one lives," Jack explains.

Jack makes it very clear that this land-based existence is not permanent. "My one and only true love will always be *expeditions*. There is something about them that's hard to put down in words. Something about conceiving the idea, then putting it into action, following it through in every tiny detail until the speck of land shows on the horizon and the operators get down to business. It's out and out adventure, but with a purpose."

Now, 1984, the Four Js (Jack, Jude, Jerome, and Jason) are on the open ocean again. The planned itinerary includes the Solomon Islands (H44), the Philippines (DU), Singapore (9V), and the Seychelles (S7) on the way to the western Indian Ocean. The DX targets there are Mayotte (FH), Glorioso (FR), and Juan de Nova (FR), in late spring or early summer.

A host of other DXpeditions are scheduled for early 1984. A group of Venezuelan amateurs intend to land on tiny Aves Island in the Caribbean. Aves (YV0), about 125 miles southwest of Montserrat, is so low to the water that high waves and tides preclude landing for much of the year. Also on tap for the coming year is another trip to Clipperton Island (FO) by a collection of Tahitian and stateside hams. And Jim Smith VK9NS (see photo) of Heard-Island fame is putting together a scientific and amateur operation on Kermadec Island (ZL/K). Closer to home, the Colvins are on the move again, and a couple of Puerto Rican amateurs are shooting for Desecheo (KP4/D)—see details, below.

YASME SAILS AGAIN

Once again, Lloyd and Iris Colvin, W6KG and W6QL (see photo), are DXpeditioning, this year concentrating on South America where contacts may be plentiful but QSLs rare. The Colvins are sailing under the auspices of the Yasme Foundation, the nonprofit group which has been sponsoring DXpeditions for many years. The name, Yasme, comes from the yacht of that name on which Danny Weil sailed for many DXpeditions twenty years ago.

The Colvins customarily set up a substantial station in each country where they operate, including beam antennas and amplifiers. They thus present a consistent signal and are quite easy to work. Also, the Colvins stay at each location for several weeks, working 5-10,000 QSOs, which gives DXers with very modest stations ample opportunity for a contact. And the Yasme Foundation QSL system is excellent.

Look for the Colvins (with portable calls or calls ending in KG or QL) toward the low ends of the bands, especially the lower frequencies. Send QSLs to Yasme Foundation, Box 2025, Castro Valley CA 94546.

DESECHEO

Two amateurs from Puerto Rico plan a DXpedition to tiny Desecheo Island in the Caribbean this month. Jose Maldonado WP4ATF and Rodolfo HI3RST/KP4 are aiming for the first week in January for

Desecheo from the air. Two Puerto Rican amateurs hope to activate KP4/D this month. (WP4ATF photo)

their three-day operation. They will use their own callsigns with the designator /D. They solicit contributions and QSLs via Box 449, Palmer PR 00721.

Desecheo was one of the last DXCC "countries" admitted under the "separate administration" rule which has since been eliminated. The island is a wildlife refuge only a few miles west of Puerto Rico. Its refuge status was the reason for its separate-country designation by the ARRL, but this same status also restricts travel to the island. The Fish and Wildlife people don't want dozens of hams swarming over their island, littering with beer cans and coax cable bits. Consequently, only a few amateur DXpeditions have operated from the island, starting with Bob Dennison WØDX.

The well-run International DX Foundation DXpedition to Descheo two years ago cleaned up most of the demand for KP4/D, but then, the definition of a rare country is "the one you don't have," regardless of how easy it is to work. Hopefully, the operators will spend some time on the lower frequencies to take advantage of the good propagation from that part of the world and to meet the increasing demands for 40-, 80-, and 160-meter DX contacts.

KEEPING INFORMED

There is a major difference between working a DXpedition versus contacting a resident of the country. In the latter case, the timing probably is not very important. If you don't work him this time, you might tomorrow, or next week, or next year. But you don't get a second chance with many DXpeditions. How long do you think it will be before hams return to Heard Island?

DXpeditions give DXers a great shot at the DX contact, and in many cases provide the *only* way for radio contacts. After all, many of these DXCC "countries" are totally uninhabited. Many are uninhabitable over the long term, and only the limited stay of a DXpedition provides DXers with a shot at them.

So the DXpedition will *not* be there next week, or next year. It may be years before that particular "country" again attracts a DXpedition. Thus the DXer cannot afford to miss the contacts offered by the DXpeditioners. If you hibernated through the Heard Island activity last year, you probably won't get another shot at it for many years.

Real DXers understand that keeping informed on a timely basis is an essential part of successful DXing, especially as the sunspots decline and the pileups increase on the few remaining DX stations.

The chief way of keeping abreast of the DX world is through the radio; active amateurs who talk to and listen to their fellow DXers will know who is on now, who is supposed to be coming on, and where. There is no substitute for activity. But there are aids which make DXing more effective and enjoyable.

You local radio club can be an excellent source of DX information. Keeping in touch with other DXers in your area is like having extra pairs of ears. You can be keeping an eye on 20 meters while a fellow DXer across town is watching 40. A quick call over VHF FM keeps both hams informed.

Many areas of the country have taken this a step further by organizing DX clubs. The larger DX clubs sponsor repeaters dedicated to DX and DXers. Now with dozens of ears out, little DX slips by. A DX station can tell when his presence is broadcast over a DX repeater easily. He first works one station in an area, say San Francisco. Then, a couple of minutes later, another DXer from the same region calls. Then stations from all over the Bay area are in the pileup!

Of course, the flow of information must go both ways. The DXer should share his success with the other members of the club and not simply take advantage of the hard work of others. And the DX club probably has many other tasks which need help: meetings, newsletters, repeater maintenance, etc. So one way you can continue your DX success is to join and support your local radio club.

Other useful sources of DX information are the DX bulletins. DX columns in the major amateur radio magazines (such as this one) have lead times too long for the kind of timely information needed in the DX world. You need to know what is on *now*, and for that a weekly DX news sheet can be well worth the money.

So to help you keep up-to-date in the DX world in 1984, the two major weekly DX bulletins are offering a free subscription to a couple of lucky readers of this column. Send your QSL card (and maybe a photo of you and your shack) to VP2ML, Box 4881, Santa Rosa CA 95402 by January 31, 1984. I'll pull a couple of cards out of my hat and present the lucky winners with a one-year subscription to *The DX Bulletin* or *QRX DX*.

If you can't wait and you aren't lucky enough to have your card pulled out of the hat, you can subscribe directly. Send $28.00 for a one-year subscription to *QRX DX*, Box 4072, Richardson TX 75080, or to *The DX Bulletin*, Box 873, Vernon CT 06066.

REVIEW

THE HEATHKIT SS-9000

From the time about two years ago that I had the opportunity to try out a prototype of the SS-9000, I have looked forward with anticipation to seeing it on the market. While the unit has many features attractive to the SSB operator, it should have special appeal to the computer-oriented operator who likes to jump from band to band and frequency to frequency in search of a good QSO or rare DX. The CW operator can take advantage of two extremely effective narrow filters in addition to the above-mentioned computer capabilities.

A floppy disk that demonstrates some of the capabilities of the unit's controller is shipped with it. The disk utilizes interaction between the computer, the operator, and the SS-9000 during the demonstration. The program that controls the unit during operation is within the unit itself, in the controller circuit, however. As a consequence, only a terminal is required, and any computer used must be reconfigured as a terminal if it is to be used to control the SS-9000. I used a Heathkit H-89 computer to run the demo disk and then had to go into the cabinet to change a jumper cable to use it as a terminal. In effect, I was dedicating the computer to use with the SS-9000 alone. My guess is that anyone who wants to control his unit with a keyboard will opt for some inexpensive terminal rather than restricting the use of his home computer to transceiver control.

Terminal Functions

The unit is programmed to remember and display both the frequencies last shown on the two frequency displays and the one stored in memory on each band. If I inadvertently bandswitch to one of these bands, the displays (and terminal printout) will return to the appropriate band limit and the stored frequencies will be lost. In order to be used, the frequencies must be retrieved by the terminal.

The terminal also controls and indicates the frequency within each band to which the receiver and transmitter have been toggled. Two push-buttons centered under the middle of the two frequency displays do this switching in the manual mode. The indicators for toggling on the unit are red LEDs for transmit and green LEDs for the receive frequencies. The displayed and remembered frequencies for each band can be established by either terminal or manual control at any time.

Some other functions the terminal can control and indicate are:

- Passband shift in 100-Hz steps—as many as 600 Hz down and 400 Hz up
- Bandswitching
- Scan rate
- Transmit/Receive
- Mode: LSB, USB, CW wide, CW medium (400 Hz), CW narrow (200 Hz), and RTTY (400 Hz)

During operation on any given band, the operator has the ability to preset all of these functions in anticipation of operating on another band.

Shared Functions: PLL Tuning

The phase-locked-loop tuning is deadly accurate to the 100-Hz steps by which it changes. No supplementary frequency standard is necessary. PLL with 100-Hz resolution introduces a problem in bringing two or more transceivers to the identical frequency. I can be as much as 50 Hz off while attempting to zero beat another signal with the SS-9000. The other station with stepless tuning might have to make up the difference. The SS-9000 CW operator might become a little frustrated with this dependence on the other operator if he is a purist. Fifty- or ten-Hertz resolution would lessen the problem of frequency matching, but for most operators the higher resolution is probably unnecessary.

Scan Rate

PLL tuning makes it practicable for the manufacturer to offer tuning up or down the band at almost any desired rate. This rate can be determined for the SS-9000 by the setting of four DIP switches. Since access is gained to these switches by removing the cover of the unit (nine screws), I probably won't change them often. On the other hand, if I'm operating with the terminal, I need only to punch S = 1 (to 16) to vary the manual scan rate through its whole range.

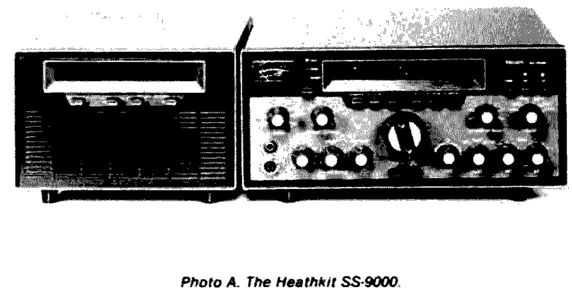


Photo A. The Heathkit SS-9000.

Memories

The practicality of the memories comes out when I'm looking for a QSO on whatever band is open. I'll flip the rig on to hear immediately a sector of a band that I have last used. Nothing new there, but I have also two other segments of the band that I can check out with two punches of a button. This happens without my losing the first frequency in the process. I can tune up or down from any of the three spots if I hear nothing interesting. If I hear a station in QSO that I might like to talk with when he finishes, I commit his frequency to memory—not my memory but the memory of the SS-9000—and resume searching for a CQ or someone finishing a QSO. If I don't find either, I can check back on the QSO with a punch of a button, and if it's still underway, resume searching with another punch.

If somehow I hear a second hot prospect for a later QSO, I can leave the one display on that second station and toggle the receiver over to the other display to continue searching. Then if I want to take a quick listen for activity on the other band, the three selections are preserved in memory.

Bandswitching

On the SS-9000, changing bands with the front-panel bandswitch can be made to activate an antenna switch for each selection. There is a plug on the back that will connect the unit directly to the Heathkit antenna switching relay. This function can, of course, be adapted to other antenna switches.

Bandswitching by computer or terminal control is another capability of this unit. A motor switches bands as well as antennas if this is desired.

On this unit, the bandswitch hung up at times when I attempted to rotate it counterclockwise manually. This could have damaged the switch if I had strong-armed it. This is because the teeth that engage during computer-controlled bandswitching are not quite separated adequately on this particular motor assembly. I expect that a call or a letter to the company could bring a new assembly in the mail. Since the assembly is located in a housing that

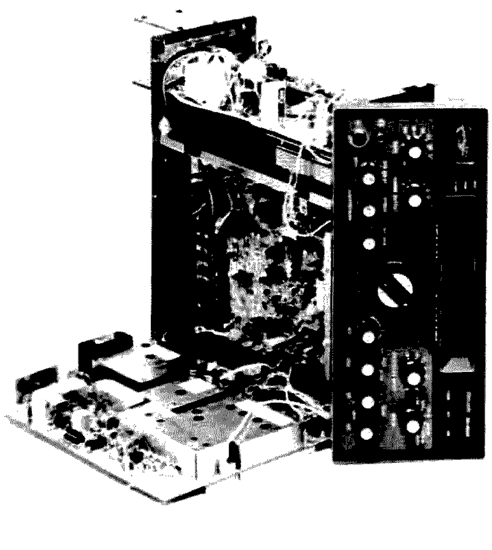


Photo B. Bottom view of the SS-9000.

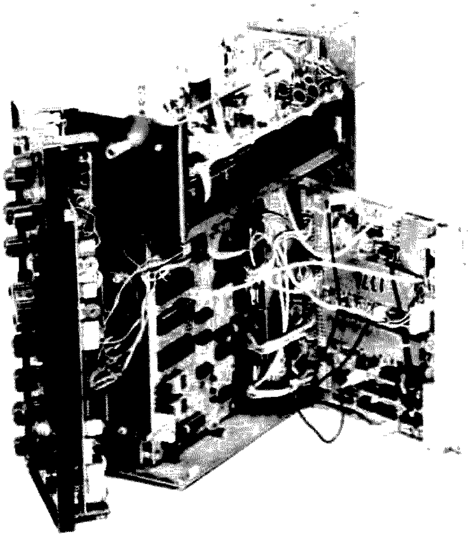


Photo C. Top view of the SS-9000.

extends from the back of the unit behind the bandswitch shaft, it would not be difficult for me to replace.

Receiving

True to the numbers given in the manual, the bandpass filter and CW filters are extremely effective. The effectiveness of the SSB bandpass filter can be demonstrated easily with a turn of the bandpass shift switch during reception with a strong interfering signal parked close by. All I sacrifice for this filtering are some of the lows of the received operator's voice, or some of the highs. Being able to drop a strong unwanted signal off the side of the bandpass plateau can result in a significant increase in intelligibility of the wanted signal.

CW Operation

Using the CW narrow filter, I can drop a strong intefering signal 100 Hz or more away down to a level at which I can copy a desired signal through it. This means, too, that the strong signal is far enough down the filter passband skirt that the agc is not triggered to the point that the weak signal doesn't get amplified adequately. In fact, the filtering is such that I am able to copy CW with the comfort of agc leveling of the desired signal almost without exception since the CW filtering renders harmless the signal-killing effect of the agc from strong stations. Another nice feature of the narrower filters is the lack of ringing I experienced. This is an especial advantage while copying high-speed CW. The SS-9000's filtering is the cleanest I have heard in this regard.

Since I'm not a musician and don't have perfect pitch, I have the same problem with the SS-9000 that I have with any other transceiver. I can't tell by ear when I have the desired signal at the offset frequency of 800 Hz. It's easy to tell by peaking the signal with the S-meter with the narrow CW filter switched in if there is no interference and/or fading. It's almost impossible otherwise to tune the transmitter exactly to the frequency of the received station without an outside reference tone.

Being able to tune as closely as possible to another signal with one's own transmitter is important. It minimizes the amount of band space taken up, it's easier for others to break in, one doesn't have to retune for each signal in a round robin, and it minimizes leap-frogging. I attempt to minimize my contribution to the problem by using a cheap audio frequency standard: a musician's pitch pipe. I tune the note of the desired signal to F-sharp, 800 Hz. Then my signal and at least one other are on the same frequency.

Transmitter

Front-panel controls in addition to the shared transceiver controls of band and frequency are: power output, VOX delay, speech compression, and microphone gain. Power output can be read directly from the multi-function meter as the power control is varied. These are all that are needed to control SSB transmissions from contact to contact. Speech compression, if desired, is switched on and turned up until compression indicated on the meter on voice peaks gives the same excursion of the needle as depressing the tune button while the meter is switched to read power. That's probably the most complicated maneuver necessary to learn to be able to take full advantage of the SSB feature of this unit. Microphone gain also is turned up on voice peaks until the meter, switched to ALC indication, shows some ALC action.

VOX delay, compression, and microphone gain may need to be varied from operator to operator, justifying the location of the controls on the front panel. Three other controls will need to be set, but not adjusted as frequently as the front-panel controls. These are: CW sidetone level, anti-trip, and VOX gain. Adjustment of these is made through the right side panel.

Power Supply

The companion power supply to the SS-9000 will operate with inputs in the 120- and 240-V-ac ranges to provide 13.8 V dc with sophisticated regulation and protection. It has high-temperature protection from heat, sink sensing, surge-current protection, and short protection. Tripping the last of the three will require resetting the on-off switch. The first two react by reducing power-supply output to safe levels until the condition reverses itself. The power-amplifier transistors of the SS-9000 are provided protection from excess current flow by these power-supply circuits as well as by power-output-controlling circuitry that is heat-sink temperature dependent, and by high vswr cutback circuitry.

The power-supply cabinet contains the speaker for the unit and two clocks, each settable by its own two front-panel buttons. The clocks will operate with either 12- or 24-hour format. The readouts are green vacuum flourescent tubes, as are the frequency displays on the SS-9000.

Summary

Setting the SS-9000 up for operation on SSB and CW was as straightforward as could be. I did not make use of the RTTY mode, but RTTY sending and receiving should be optimally simple also. A 400-Hz RTTY filter position is provided in the mode switch as well as the usual LSB.

The several controls that must be dealt with in order to operate SSB are easily set using the owner's manual. Front-panel-control changes, such as power output, VOX delay, compression, and microphone gain are extremely simple with the multi-function metering provided at the touch of a button.

Operating the SS-9000 with an amplifier is easily arranged. After stringing a phono-plugged cable for the relay and the ALC voltage, I just punched the tune button and screwdriver-adjusted the ALC level in the back panel to limit the amplifier current properly by limiting drive power.

I had to get used to operating CW without QSK, coming from a rig that has a carrier-operated relay (COR). It was good discipline for me to attempt to keep my transmissions short. Rumor has it that it was felt the frequency synthesizer loops might be too unstable while using the COR in this unit with high-speed CW. As you can tell from the advertisements, only very recently have manufacturers developed confidence enough in their designs to offer full break-in operation with PLL tuning, Heathkit included.

Conclusion

I very much enjoyed indulging in fantasies about how I could take advantage of the unique features of this rig. One idea most appealing was to buy some cheap high-lying property in my local telephone-calling area or within UHF range and set up the SS-9000 right in the middle of a huge antenna farm. A terminal with modem could control the unit, and I could operate from any convenient room in the house.

The capability of terminal control rather than computer and software control appeals to me. I'm eager to develop applications for personal computers in my life, but I'm not enthusiastic about dedicating a PC to a single use. If the feature of terminal control and the concept of a quality-built, sensitive, selective, adaptable transceiver appeal to you, give the SS-9000 serious consideration.

For further information, contact the *Heath Company, Benton Harbor MI 49022.* Reader Service number 484.

Dave Learned W8DFI
Benton Harbor MI

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

A BOOK ON AMTOR: WHAT, WHY, AND HOW

AMTOR means *AM*ateur *T*eletype *O*ver *R*adio and provides almost error-free

transmission and reception of messages. A form of RTTY that uses a seven-bit (Moore) code, TOR has been in use by both land-based and sea-based stations for several years but has been adopted by amateurs only recently.

The International Telegraphic Union Report CCIR 476-2 (1978) formed the basis for the 1983 FCC approval of AMTOR, and provides a set of operating standards and procedures.

And now, because of the relative newness of AMTOR to the amateur-radio fraternity and because some of the introductory articles that appeared in amateur magazines have been missed by amateurs who may be interested in trying out this new mode of communication, Phil Anderson W0XI has put out a neat, soft-cover publication called *Introduction to and the Operation of AMTOR.*

The table of contents lists a preface and introduction and chapters entitled Why AMTOR, Basic Equipment, Basic Operating Procedures, An Operating Example: AMTORSOFT (Copyright 1983 by Kantronics, Inc.), and Theory of Operation, AMTOR; there also is an appendix which includes chapters on a "Brief History of AMTOR," a table of the AMTOR code, and references.

The author uses cartoons in an early chapter to relate the reader to the idea of AMTOR, showing how interference can be minimized through repetition of the message and how an acknowledgement of message received is an important element of the system.

The booklet describes how essentially error-free comunication can result in spite of fading, interference, and the use of low power by either or both stations in a two-way circuit. It shows the reader what equipment is required, basic operating procedures, where to find and how to tune AMTOR, how to establish contact, how to send and receive messages, and provides dozens of other vital pieces of information that one will want to know when beginning. Retail price of this 37-page booklet is $3.50.

For further information, contact *Kantronics, Inc., 1202 East 23rd Road, Lawrence KS 66044.*

Jim Gray W1XU
***73* Staff**

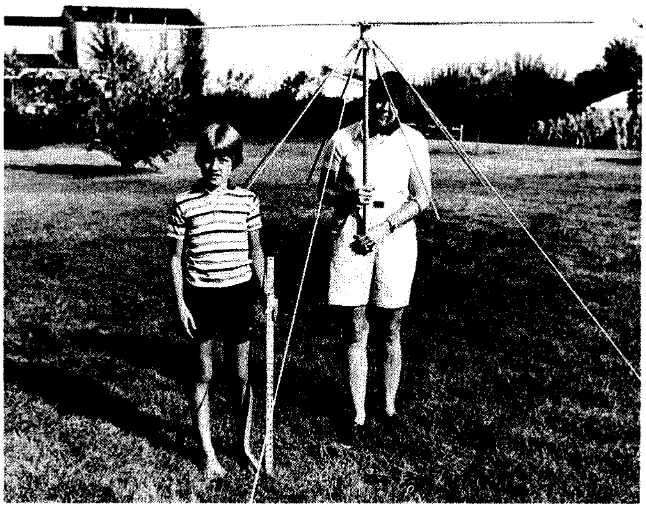


Photo A. The yardstick held by Alex Torres indicates size of the discone held by Joan Torres.

THE J. C. LABS ACTION MONITOR

The first thing you'll ask yourself—as I did—is, "Why hasn't someone done that before?"

The Action Monitor is one of those devices that is simple, neat, and effective... besides which it is *needed*! Let me give you an example.

How many of you have a scanner or monitor that has to be left unattended much of the day (or night)? There may be something that comes over the monitor that you want to know, or even have to know... yet you can't be there.

How about a DX station that you have been waiting for on a spot frequency, but you have to go to work and may never know whether it ever showed up?

If you've ever worried about not getting that vital message, or capturing that signal that you wanted, the Action Monitor by J. C. Labs is for you. Here's how it works.

The Action Monitor is actually a VOX unit that operates a built-in switch to turn on a tape recorder or other recording device. You attach the speaker output of your receiver or scanner to the input terminals of the Action Monitor by a pair of wires. These can be audio wire, zip cord, or even a shielded pair, although it isn't necessary to go to shielded wire unless you want to.

Next, you attach one of the output leads of the Action Monitor to the tape recorder's push-to-talk input jack by means of the mating plug already furnished; and finally, you attach the other output lead to the tape recorder's microphone input jack by means of the mating plug also furnished. Now you are ready to record.

There is an ON-OFF switch on the Action Monitor. In the OFF position, the Action Monitor is not functional and your scanner or receiver functions normally—that is, without recording anything. Now comes the good part: You turn the switch to ON and you set the tape recorder to the RECORD position. Then tune in a signal on the receiver and watch what happens. As soon as the signal is received, the Action Monitor automatically turns the tape recorder on, and it records the received signal.

In case you wonder about it turning off too soon and missing a reply, Jim Casamassa of J. C. Labs has that all figured out: He provides a two-second delay in the Action Monitor so that it doesn't shut the recorder off immediately. Thus, if there is another signal following the first one by a short delav it also is picked up. Neat, huh?

Okay, how well does it work, you'd like to know? *It works just great!* My thing, for instance, is monitoring the aircraft bands. I like to listen to the commercial airliners call in to the Boston Air Traffic Control Center, so I merely hook up my aircraft monitor receiver to my tape recorder through the Action Monitor, and let it record while I am away from home.

In case you wonder why I do that, let me say that it's not mere curiosity. I happen to be a pilot who uses radio communications in my aircraft. Aircraft radio procedure is short, terse, clipped, and *fast.* It takes a bit of getting used to, and you have to mentally gear up to understand it ...particularly when you receive instructions to make a complicated approach. I find that the only way for me to be able to understand these rapid-fire contacts is to practice, practice, and practice listening, and the Action Monitor is the perfect way to do it simply and painlessly. I can get a tape full of information over a period of a day's time, so that when I get home in the evening, I can listen to the tape and hear what has happened while away. Best of all, I can replay the tape again and again to get that important practice.

Your use of the Action Monitor may be somewhat different than mine, of course, but that doesn't mean it will be less useful. A friend of mine listens to those "secret" frequencies where nothing happens for hours—even days—at a time. Then, suddenly, there is a burst of information. The Action Monitor is there, ready as always, to catch and record the transmission. Clandestine-radio monitors will find the Action Monitor to be absolutely necessary for their purposes—it is a valuable tool that saves time and money.

Speaking of which, you ought to know that the Action Monitor costs only $39.95 (plus $2.00 shipping and handling)—an extremely affordable price, in this writer's opinion, for something that is as useful and simple as this device. As I said in the beginning, why hasn't it been done before?

Oh, yes, one more thing: The Action Monitor comes complete with 9-V battery for powering the VOX circuit. While the battery seems to last forever, it is possible to use an ac adapter to furnish the necessary direct current. J. C. Labs furnishes one that is suitable for use with the Action Monitor for $8.95, as an optional accessory, plus a $1.00 shipping and handling charge.

For more information, contact *J. C. Labs, PO Box 183, Wales WI 53183; (414)-547-7987.* Reader Service number 482.

Jim Gray W1XU
***73* Staff**

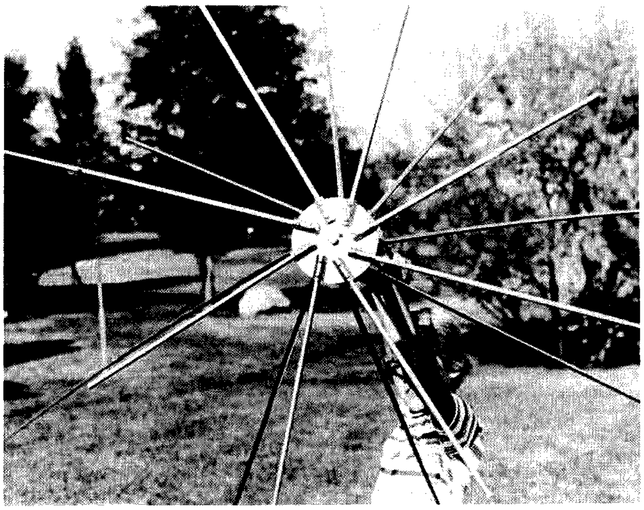


Photo B. Top view of the discone.

A NEW DISCONE ANTENNA FOR AMATEUR SERVICE

For the past twenty years, the discone antenna has been a very popular item among military communicators, and until recently, the only source for such antennas was the military surplus business. But things are changing, and in the last few months, TET (Taniguchi-Engineering-Traders, Yokohama, Japan) has introduced a discone antenna for amateur use.

The useful frequency range of the antenna is an impresssive 50 to 480 Megahertz continuous. That's one of the biggest payoffs of a discone: about an octave worth of bandwidth. TET claims that the swr anyplace in the useful frequency range is less than 1.5:1. Let me tell you, I tested the antenna at 146 MHz, 220 MHz and 450 MHz, and the worst swr obtained was 1.3:1—a very impressive performance.

The gain of the antenna is given at 3 dBi, and in a quick comparison between a quarter-wave vertical whip and the discone, the discone came out ahead by 2.8 dB. Considering that the measurement was relatively crude (even though it was done in an anechoic chamber), I probably would go along with the specifications given by TET.

Maximum power limit on this jewel is 500 Watts. The most impressive part of the antenna is the way it was built. The metal used is high-quality aluminum and the hardware used is all stainless steel. Assembly of the antenna took me about one hour (that includes two long-distance telephone interruptions) after figuring out the conversion from metric to inches (my tape measure is in inches). Mechanically, the antenna is about as strong as a mule, yet the unit only weighs 6.5 pounds.

The longest element, part of a radial, is 2200 mm (86.6"). This seven-foot radial is needed for 50-MHz operation. Photo B shows the top of the discone, and Photo C shows the insulator between the driven elements and the reflectors. It is made of a very hard and durable plastic, solid, and about 2 inches in diameter.

The antenna can be mounted on top of an HF monobander or tribander. It has about the same performance as a Ringo Ranger but much wider frequency operating range. This antenna will work very well

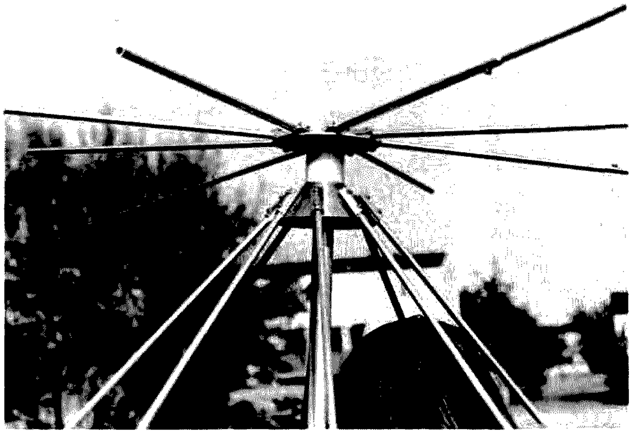


Photo C. The two discs of the discone, top (radiator) and bottom (ground-plane reflector).

on 2 meters, 220 MHz, and 450 MHz; it is vertically polarized, which makes it compatible with repeaters and FM simplex operation.

The angle of radiation is relatively low, at approximately 15° from the horizontal plane. Fig. 1 shows the angle of radiation relative to a quarter-wave vertical antenna. The GDX-2 is made with a metal coupling that mounts on the top of the SO-239 connector to protect such a connector from the weather.

For those of you willing to take the plunge, the antenna is now available from US TET distributors. (I bought this one from Sultronics, Inc., Xenia, Ohio.) The antenna was bought by DARA (Dayton Amateur Radio Association) for evaluation purposes; it was given as a door prize at one of the association meetings.

We paid the standard price of $79.95 for the antenna. Considering the wide bandwidth, the rugged construction, and its performance, the price is very good. The alternative would be to build three antennas and three feedlines plus connectors.

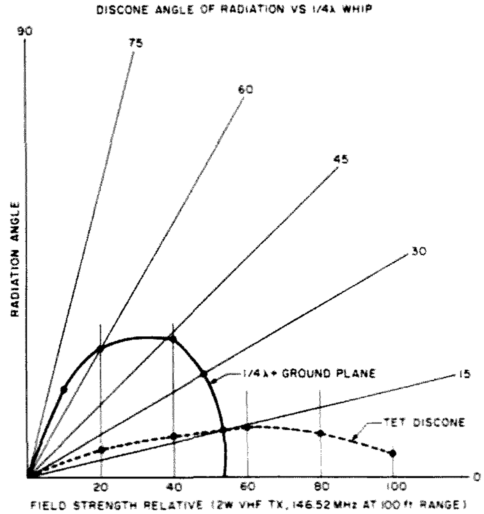


Fig. 1. Angle of radiation relative to a quarter-wave vertical.

The discone comes ahead financially after making the tradeoff.

For further information, contact *TET Antenna Systems, 1924-E W. Mission Road, Escondido CA 92025; (714)-743-7025.* Reader Service number 483.

Al Torres KP4AQI
Technical Chairman
Dayton Amateur Radio Assn.

References

1. *TET Antenna Systems*, GDX-2 Instruction Manual.
2. *ARRL Radio Amateur Handbook*, 1983 edition, p. 20-16 to 20-18.
3. Kraus, J. D., *Antennas*, McGraw-Hill Book Co., New York NY, 1950, p. 420-422.
4. *ARRL Antenna Handbook*, 1976 edition, p. 57.

NEW PRODUCTS

AEA RTTY SOFTWARE

AEA has released several new RTTY software packages for the Commodore machines. The MBAText is an advanced Morse, Baudot, and RTTY package for the VIC-20 or C-64, and includes a keyboard overlay for easy operation. The program includes RTTY and ASCII speed-estimate mode, as well as automatic speed tracking and lock-on capabilities. Dedicated function keys, message buffers, and hardcopy and magnetic media storage all make for easy, full-capability operation.

The AEA Micropatch™ is a low-cost Morse, Baudot, and ASCII software/hardware interface package. The Micropatch incorporates the MBAText software ROM, and adds dual-channel mark and space Chebyshev active filters. Automatic threshold correction makes for good copy when one tone is obliterated by QRM or selective fading. Several shifts are switch-selectable, and the triple-LED indicator creates an easy-tuning environment.

AEA has also produced two AMTOR products, the AMTORText™ and the MicroAMTOR Patch™. AMTORText will allow the Commodore 64 to be used as an AMTOR terminal with all the features. The menu-driven program makes it easy to run, and comes complete with SELCALL, ARQ, and break-in operation capabilities.

Combine the AMTORText program with high-quality hardware, and you get MicroAMTOR Patch. Four-pole active filters, automatic PTT, and an EXAR 2206 sine generator make this interface capable of copying through severe QRM.

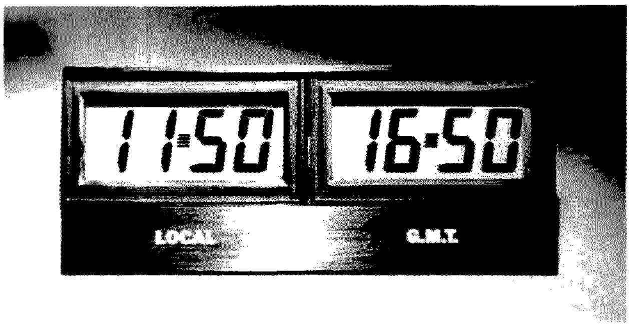
For more information, contact *Advanced Electronic Applications, Inc., PO Box C-2160, Lynnwood WA 98036; (206)-775-7373.*

BHC'S NEW BHC—THE BIG HAM CLOCK

BHC, Inc., has just introduced their Big Ham Clock, the latest of large liquid-crystal-display clocks in small packages. The clock has two large (5/8" tall) LCD modules, one for local time (12- or 24-hour type) and one for GMT. Each clock module can be programmed for your desired combination of: month/day, hours/minutes, seconds, and set to WWV (hack).

Each of the big modules will run one to three years on the replaceable battery. Both modules are mounted in a black anodized desk-top frame.

The Big Ham Clock is available from amateur radio dealers and distributors, or may be ordered directly from *BHC, Inc., 1716 Woodhead, Houston TX 77019.* Reader Service number 477.



BHC's Big Ham Clock.

NEMAL'S SATELLITE CONTROL CABLE

Nemal Electronics International, Inc., has just introduced a new type of combination cable designed for the satellite television industry. As a supplier of cable, connectors, and SMATV products to the satellite television market for over seven years, Nemal has responded to a need for an all-purpose cable for TVRO installations.

Consisting of nine individual conductors plus a 96% copper-shielded RG59/U coaxial line, the Nemal SCC (Satellite Control Cable) provides for all the requirements of most TVRO equipment in one direct burial cable. On the nine conductors, there are five #22-gauge standard copper, two 22-gauge shielded with a third drain wire, and two #18-gauge wires. All wires are color coded to industry standards for easy identification.

Nemal SCC is available in 500- and 1000-foot rolls, as well as by the foot. For additional information, please contact *Nemal Electronics International, Inc., 12240 N.E. 14th Avenue, North Miami FL 33161; (305)-893-3924.* Reader Service number 478.

INFORMATION PACKETS BY H. STEWART DESIGNS

H. Stewart Designs recently announced the availability of its design-information packet for a unique indoor antenna called the DX Hidden Asset Loop Antenna. This antenna is intended for use by apartment and condo dwellers, and others who are frustrated by antenna space restrictions. An antenna made from the information supplied has a vertically-polarized omnidirectional radiation pattern ideal for working mobiles and for DXing.

Intended for mounting in an attic or crawl space (and outdoors, too, if you should be lucky enough to have roof space available) a DX Hidden Asset Loop Antenna built for the ten-meter band would be only 40 inches tall and 55 inches in diameter. It is electrically balanced, independent of ground, and does not require radials or a ground connection.

Constructed from wire and other simple, readily-available materials, the DXHA looks like two four-foot halos arranged in a horizontal plane, mounted one above the other and separated by a little over three feet. The two loops are joined by two vertical wires spaced a few inches apart, and the coax feedline attaches to the center of one of the wires. Radiation is mainly from the verticals and, possibly, the antenna could be thought of as top-and-bottom-loaded radiators, although that has not been suggested by the literature.

If made from aluminum tubing and supported by some PVC pipe, it would appear as if the antenna could be self-supporting and well suited to outdoor mounting. H. Stewart Designs gives the construction for a wire-and-wood antenna but suggests that other possibilities exist. The informa-

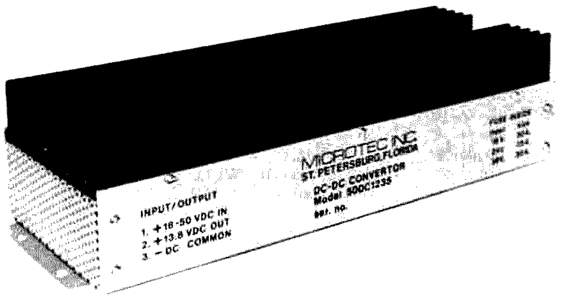
tion package contains drawings, tables of dimensions, diagrams, and assembly/tuning instructions for several popular high-frequency amateur bands from two through fifteen meters.

We at *73* will be putting together a ten-meter version for evaluation and will report results in the Product Review section within a few months. Meanwhile, for further information, contact *H. Stewart Designs, PO Box 643, Oregon City OR 97045.* Reader Service number 481.

GUIDE TO RTTY FREQUENCIES

Interest in monitoring RTTY signals in the shortwave spectrum has caught the fancy of thousands of hams and SWLs. Receiving RTTY signals has been greatly simplified through the use of computer technology and stable HF receiving equipment. In keeping pace with this explosive growth, the second edition of the *Guide to RTTY Frequencies* has double the amount of information and number of pages as the 1980 first edition.

Compiled and edited by O. P. Ferrell, the *Guide to RTTY Frequencies* details the frequency, callsign, location, power, speed, and shift, plus schedules of over 5000 RTTY stations and frequencies in use. The book is conveniently divided into two separate lists: the first by frequency, the second a reverse list by callsign. Included in the lists are military, weather, aeronautical, embassy, press, traffic, and coastal RTTY stations and nets. This is the most comprehensive listing of RTTY stations ever published.



Microtec's dc-dc converter.

The introductory text provides an overview of the techniques of RTTY reception with short articles on Russian Cyrillic, Hellschreiber, test signals, and an explanation of how to use the station lists. RTTY newscasts are given special consideration in the *Guide*. For the first time in print, the *Guide to RTTY Frequencies* gives definitive schedules, details on beam headings, "silent days," special shift patterns, etc. The author gives some advice on buying equipment just to copy RTTY newscasts, pointing out that the number of RTTY newscasts that can be monitored in North America has been steadily decreasing although activity in all other services is expanding.

For more information, contact *Gilfer Associates, Inc., 52 Park Avenue, PO Box 239, Park Ridge NJ 07656; (201)-391-7887.* Reader Service number 476.

A 25-W AMPLIFIER FOR TWO METERS

Ham Industries, Inc., which recently expanded its product line, has announced the availability of its first ham product, the PA-25, a very compact 25-Watt amplifier for the 2-meter band.

Weighing 8 ounces, the PA-25 can be attached to a hand-held or mounted to a car dashboard with the accessory mounts included. It will boost output power up to 6 times for a hand-held transceiver. An adapter cord allows plugging into a cigarette lighter, or a separate power supply can be used.

To order, or to obtain further information, contact *Ham Industries, Inc., Inspection Products Division, 835 Highland Rd., Macedonia OH 44056, (212)-467-4256.* Reader Service number 479.

THE MICROTEC 50DC1235 DC-DC CONVERTER

Magnum Distributors, Inc., has introduced another power-conversion product, the model 50DC1235, designed and manufactured by Microtec, Inc.

The model 50DC1235 is a commercial-grade, high-efficiency, high-current, continuous-duty, dc-dc converter. Specifications: 18-50-V-dc input, 13.8-V-dc output at 30 A. Continuous, 35 A intermittent (35 A continuous with forced air cooling); regulation: line 0.1% temp. 0.5%; output ripple and noise: less than 5 mV rms at max. load; efficiency: 83-90% input and output protection; size: 13.5" x 3.25" x 4.5"; weight: 5 lbs.; construction: all non-ferrous, 1 year warranty. Complete specifications upon request.

For additional information and pricing, contact *Magnum Distributors, Inc., 1000 S. Dixie Hy. W. #3, Pompano Beach FL 33060; (305)-785-2002.* Reader Service number 480.

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

3RD ANNUAL 40-METER WORLD SSB CHAMPIONSHIP 0000Z to 2400Z January 7, 1984

SPONSORED BY:

73: Amateur Radio's Technical Journal.

MISCELLANEOUS RULES:

Work as many stations as possible on 40-meter phone during the specified times of allowable operation. The same station may be worked *once*. Crossmode contacts will not count. Single-operator stations may operate a total of 16 hours. All multi-operator stations may operate the entire 24-hour period. Off periods must be noted in your log(s) and on your summary sheet. Off periods are *no less than 30 minutes each.*

OPERATOR CLASSES:

(A) Single operator, single transmitter, phone only. (B) Multi-operator, single transmitter, phone only.

EXCHANGE:

Stations within the continental 48 United States and Canada transmit an RS report and state, province, or territory. All other stations, including Alaska and Hawaii, transmit RS report and DX country.

POINTS:

5 QSO points for contacts with W/VE stations located within the continental 48 United States and Canada. All other contacts score 10 points each. List points for each contact on your log sheet(s).

MULTIPLIERS:

1 multiplier point is earned for each US state, 48 maximum (a District of Columbia contact may be substituted for a Maryland multiplier), each Canadian province or territory (13 maximum), and DX country (excluding the continental US and Canada).

FINAL SCORE:

Total QSO points times total multiplier points equals *claimed score.*

CONTEST ENTRIES:

Each entry must include a contest log, a dupe sheet, a contest summary, and multiplier checklist. We recommend that contestants send for a copy of the contest forms. Send an SASE to the contest address listed below.

CONTEST DEADLINE:

Each entry must be postmarked no later than February 12, 1984.

DISQUALIFICATIONS:

Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each operator class in each of the continental 48 United States, Canadian provinces and territories, and each DX country represented. A minimum of 100 QSOs must be worked to be eligible for contest awards.

CONTEST ADDRESS:

To obtain entry forms or to submit an entry, contact: 40-Meter Contest, Dennis Younker NE6I, 43261 Sixth Street East, Lancaster CA 93535.

THE TSRAC BNT

NEWSLETTER OF THE MONTH

"The A. R. *club* publication that *tries* to be different." That's the self-proclaimed motto of The Triple States Radio Amateur Club's *TSRAC BNT*, this month's contest winner. How are they different from most other newsletters?

Well, sure, they have news about club members and news about hamfests and special events. News about past and future happenings. "The Trading Post" classifieds. Some paid advertising. News (and a coupon) about a new Novice class. FCC and ARRL news. Articles (September issue) such as "Simulated Disaster Turns into the Real Thing" and "Helping the FCC at Midnight!" News about the newsletter itself—editorial and subscription info. Letters to the Editor. News "From the Editor's Desk" for readers. Some photos of hams in action. ARES news. A League membership application. More news.

Get the picture? News, news, news—crammed into this 24-page single-spaced issue. Editor Ralph McDonough K8AN's club doesn't get this award for news, though. They get it for taking the time and an awful lot of space to congratulate and recognize club members for their personal and club efforts. They *try* to be different by doing this and we feel that they more than succeed.

Our congratulations go out to Ralph, his helpers (however unsung), and *TSRAC* for a job very well done.

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

3RD ANNUAL 75-METER WORLD SSB CHAMPIONSHIP 0000Z to 2400Z January 8, 1984

SPONSORED BY:

73: Amateur Radio's Technical Journal.

MISCELLANEOUS RULES:

Work as many stations as possible on 75-meter phone during the specified times of allowable operation. The same station may be worked *once*. Crossmode contacts will not count. Single-operator stations may operate a total of 16 hours. All multi-operator stations may operate the entire 24-hour period. Off periods must be noted in your log(s) and on your summary sheet. Off periods are *no less than 30 minutes each.*

OPERATOR CLASSES:

(A) Single operator, single transmitter, phone only. (B) Multi-operator, single transmitter, phone only.

EXCHANGE:

Stations within the continental 48 United States and Canada transmit an RS report and state, province, or territory. All other stations, including Alaska and Hawaii, transmit RS report and DX country.

POINTS:

5 QSO points for contacts with W/VE stations located within the continental 48 United States and Canada. All other contacts score 10 points each. List points for each contact on your log sheet(s).

MULTIPLIERS:

1 multiplier point is earned for each US state, 48 maximum (a District of Columbia contact may be substituted for a Maryland multiplier), each Canadian province or territory (13 maximum), and DX country (excluding the continental US and Canada).

FINAL SCORE:

Total QSO points times total multiplier points equals *claimed score*.

CONTEST ENTRIES:

Each entry must include a contest log, a dupe sheet, a contest summary, and multiplier checklist. We recommend that contestants send for a copy of the contest forms. Send an SASE to the contest address listed below.

CONTEST DEADLINE:

Each entry must be postmarked no later than February 12, 1984.

DISQUALIFICATIONS:

Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each operator class in each of the continental 48 United States, Canadian provinces and territories, and each DX country represented. A minimum of 100 QSOs must be worked to be eligible for contest awards.

CONTEST ADDRESS:

To obtain entry forms or to submit an entry, contact: 75-Meter Contest, Jose A. Castillo N4BAA, 1832 Highland Drive, Amelia Island FL 32034.

CALENDAR

Jan 7	73 40-Meter World SSB Championship
Jan 8	73 75-Meter World SSB Championship
Jan 14-15	73 160-Meter World SSB Championship
Jan 14-15	Hunting Lions in the Air Contest
Jan 14-15	ARRL VHF Sweepstakes
Jan 20-22	A5 WAS SSTV Contest
Jan 21-22	North Dakota QSO Party
Jan 27-29	CQ Worldwide 160-Meter DX Contest—CW
Jan 28-29	Michigan YL QSO Party
Jan 28-Feb 5	ARRL Novice Roundup
Feb 4-5	South Carolina QSO Party
Feb 4-5	Arizona QSO Party
Feb 4-5	Vermont QSO Party
Feb 4-5	Zero-District QSO Party
Feb 11-12	Dutch PACC Contest
Feb 18-19	American Radio Club International DX Contest
Feb 18-19	YL-ISSB Commo System QSO Party—Phone
Feb 18-19	ARRL DX Contest—CW
Feb 24-26	CQ Worldwide 160-Meter DX Contest—SSB
Feb 25	RTTY World Championship
Mar 3-4	ARRL DX Contest—Phone
Mar 17-18	YL-ISSB Commo System QSO Party—CW
Mar 17-18	Bermuda Contest
Mar 17-18	Spring QRP CW Activity Weekend
Jul 13-15	A5 International SSTV-DX Contest
Aug 11-12	New Jersey QSO Party
Aug 24-27	A5 North American UHF FSTV-DX Contest
Sep 22-23	Late Summer QRP CW Activity Weekend

RATS NEST AND CROOKED STICK IV
2100Z January 8 to 0100Z January 9

This antenna experimenter's contest sprint is sponsored by the Issaquah Amateur Radio Club. A Rats Nest and Crooked Stick antenna is 100 feet maximum of single-conductor wire (solid or stranded), any configuration. Feedline will not have to count as part of the 100 feet unless it is coaxial cable. Antenna height is limited to *20 feet* at the center of high current, i.e., center of dipole, center of quad, base of 1/4-wave vertical. Transmitter power shall be 250 Watts or less (dc input).

FREQUENCIES:

CW—21.060 to 21.200 MHz.
SSB—21.350 to 21.450 MHz.

EXCHANGE:

Name, location (QTH), type of antenna, IARC member—yes or no.

SCORING:

CW contact—21.060 to 21.099 MHz, 5 points; CW contact—21.100 to 21.200 MHz, 10 points; SSB contact—21.350 to 21.450 MHz, 2 points.

A station may be contacted once on SSB and once on CW. Each dupe the contest committee finds is penalized by a loss of 10 points.

Bonus points awarded as follows: each new state worked, 3 points; worked all seventh-call-area states (8), 50 points; worked all states (50) 75 points; each new call area worked, 5 points; worked all ten US call areas, 35 points; 7 or more CW contacts, 25 points; 15 or more CW contacts, 75 points; each DX contact (KH6, KL7, VE, XE, JA, etc.), 5 points.

CATEGORIES:

1. Non-IARC member using a Rats Nest and Crooked Stick antenna. 2. IARC member using a Rats Nest and Crooked Stick antenna. 3. IARC member using a conventional base-station antenna. 4. A station making contact with three IARC members during contest.

AWARDS:

In each of the above categories 1, 2, and 3: A. High overall score. B. High CW score (without bonus). C. High SSB score (without bonus). D. High Novice/Technician score. E. Participant (1 hour or more operation).

In category 4: "Rat Catcher" certificate.

ENTRIES:

By February 1, 1984, submit summary sheet-points per mode, bonus points earned, total points earned, name, call, address, complete description of antenna and equipment used, license class. Log sheet—time, call, frequency, mode, exchange.

For Rat Catcher entries, submit log sheet showing three contacts with Issaquah Amateur Radio Club members during contest.

All correspondence must include an SASE sent to: Issaquah Amateur Radio Club, Bob Farnworth KB7NV, 6822 131st Ave. S.E., Bellevue WA 98006. All decisions of the contest committee will be final.

RESULTS

1983 ARIZONA QSO PARTY

Arizona Stations

Call	QTH	Score
*K6LL	Yuma County	75,468
*KB7KZ	Pima County	16,965

Non-Arizona Stations

Call	QTH	Score
*W5PWG	Texas	200
W5WG	Louisiana	170

* Certificate winner

5TH ANNUAL 160-METER WORLD SSB CHAMPIONSHIP
0000Z January 14, 1984 to 2400Z January 15, 1984

SPONSORED BY:

73: Amateur Radio's Technical Journal.

OBJECT:

To work as many stations as possible on 160-meter phone in a maximum of 32 hours allowable contest time. Multi-operator stations may operate the entire 48-hour contest period. Stations may be worked only once.

ENTRY CATEGORIES:

(A) Single operator, single transmitter, phone only. (B) Multi-operator, single transmitter, phone only.

EXCHANGE:

Stations within the continental US and Canada transmit RS report and state or province/territory. All others transmit RS report and DX country.

POINTS:

5 QSO points for contact with W/VE stations contacted within the continental 48 United States and Canada. All other contacts earn 10 points each.

MULTIPLIERS:

1 multiplier point will be earned for each of the continental United States. 48 maximum (a District of Columbia contact may be substituted for a Maryland multiplier), each of the Canadian provinces/territories (13 maximum), and each DX country outside the continental 48 United States and Canada.

FINAL SCORE:

Total QSO points times total multiplier points equals *claimed score*.

CONTEST ENTRIES:

Each entry must include log sheets, dupe sheet for 100 or more contacts, a contest summary, and a multiplier check sheet.

ENTRY DEADLINE:

All entries must be postmarked no later than February 19, 1984.

DX WINDOW:

Stations are expected to observe the DX window from 1.825-1.830 MHz as mutually agreed by top-band operators. Stations in the US and Canada are asked not to transmit in this 5-kHz segment of the band. During the contest, all W/VE stations are requested to utilize only those frequencies from 1.808-1.825 and 1.830-1.900 MHz.

DISQUALIFICATIONS:

Disqualification may result if a contestant omits any required entry form, operates in excess of legal power authorized for his/her given area, manipulates operating times to achieve a score advantage, or fails to omit duplicate contacts which reduce the overall score more than 2%. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each entry category in each of the continental United States, each Canadian province/territory, and each DX country. A minimum of 100 QSOs must be worked to qualify.

CONTEST ADDRESS:

To obtain information or entry forms (enclose an SASE) or to submit a contest entry, contact: 160-Meter Contest, Harry Arsenault K1PLR, 603 Powell Avenue, Erie PA 16505.

HUNTING LIONS IN THE AIR CONTEST

Starts: 1200 GMT January 14
Ends: 1200 GMT January 15

The contest is sponsored by Lions Clubs International and coordinated by Lions Club Rio de Janeiro Arpoador, Brazil. Participation in the contest is open to all duly licensed radio operators, Lion and non-Lion. There are two modes: phone and CW. Participation in both modes is allowed but points are counted separately. All amateur stations participating must operate within their licensing regulation. Separate categories will exist for single operators and radio clubs/societies. Multi-operators may participate as long as they do not operate simultaneously with the same callsign. However, each callsign used must be listed on the log.

Use all bands, 80, 40, 20, 15, and 10 meters. Only one QSO with the same station on each band may be counted. Remember that phone and CW are counted separately!

EXCHANGE:

RS(T) and sequential QSO number. When a contact is made with any Lion, Leo, or Lioness, the name of the club contacted should be clearly identified.

SCORING:

QSOs within the same continent count 1 point while those between different continents count 3 points. Score 10 extra bonus points for each QSO with a member of a Lion, Lioness, or Leo Club from a different country or 5 points within the same country. Score 20 bonus points for a QSO with a member of the Lions Club Rio de Janeiro Arpoador. Contacts between Brazilian stations and members of the Arpoador club will count only 5 extra points. Contacts between members of the Arpoador club will not count any bonus points.

AWARDS:

For single-operator entries, Lions Clubs International will present trophies for first, second, and third places on both modes. Fourth through tenth places will receive plaques. In addition, each participant sending a log with a minimum of 5 contacts will receive a special certificate. The contest committee will also select and reward the most active Lions Club participating in the contest.

ENTRIES:

Keep a separate log for each mode. Each participant will note in the log the callsign and information exchanged. Confirmation of contacts will be made by comparing the logs of the participants. Participants should send their logs by airmail no later than Feb. 5 to: Contest Committee, Hunting Lions in the Air, Lions Club of Rio de Janeiro Arpoador, Rua Sao Francisco Xavier #246, Apt. 407, 22550 Rio de Janeiro, RJ, Brazil.

A5 WAS SSTV CONTEST

Starts: 1800 EDT January 20
Ends: 1800 EDT January 22

This is the 3rd annual contest sponsored by *A5 ATV Magazine*. The object is to work as many different US states as possible on the video mode. All contacts must be in video form with a minimum of callsign and RSV signal reports sent and received. Count 10 points per SSTV QSO regardless of location, with 100 points awarded for each new state. Contacts with Alaska or Hawaii on SSTV count 500 points. Top scorer will receive a free 3-year subscription to *A5 ATV Magazine* with 1-year subscriptions going to District leaders. All entrants will receive a special gold specialized-communications certificate suitable for framing. Logs must be sent to: Contest Manager, *A5 ATV Magazine*, PO Box H, Lowden IA 52255. Indicate state and score on the front of the envelope. Logs and photos sent will be returned at the close of the contest judging period. Results should be published in the March or April, 1984, issue of *A5 ATV Magazine*.

NORTH DAKOTA QSO PARTY

0000 to 0800 and 1600 to 2400 GMT January 21
0800 to 1600 GMT January 22

Sponsored again by the Red River Radio Amateurs of Fargo ND. Work stations once per band and mode.

EXCHANGE:

RS(T) and state, province, country, or North Dakota county.

FREQUENCIES:

Phone—1835, 3905, 7280, 14295, 21380, 28580.
CW—1810, 3540, 7035, 14035, 21035, 28035.
Novice—3725, 7125, 21125, 28125.

SCORING:

Phone contacts count 10 points, CW 20 points, and RTTY 50 points. North Dakota stations count an additional 100-point bonus for working five Novices. North Dakota stations multiply score by total of states, provinces, and countries worked. Others multiply by the number of North Dakota counties worked (max 53).

ENTRIES & AWARDS:

Certificates to state, province, and country winners. Plaque to North Dakota winner and highest scorer outside North Dakota. Mail logs by February 28th to: Mike Beaton KDØA, 2267 Flickertail Dr., Fargo ND 58103. Include a large SASE for results.

CQ WORLDWIDE 160-METER CONTEST-CW

Starts: 2200 GMT January 27
Ends: 1600 GMT January 29

Operating classes include both single and multi-operator (maximum of 5 ops per station).

EXCHANGE:

RST plus QTH, and state for USA, province for Canadian.

SCORING:

Contacts with stations within own country are 2 points, other countries but same continent are 5 points, other continents are 10 points. KH6 and KL7 are considered countries.

Multipliers are each US state, VE province, and DX country. USA and Canada are *not* country multipliers. However, there are three VE1 provinces: New Brunswick, Nova Scotia, and Prince Edward Island. Final score is total QSO points times the sum of the multipliers. Maritime-mobile scoring will be determined by the location.

AWARDS:

Certificates to the top scorers in each class in each US state, VE province, and DX country. Special plaques are also being awarded for top USA, Europe, and world scores.

PENALTIES:

Three additional contacts will be deleted from the score for each duplicate, false, or unverifiable contact removed from the log. A second multiplier will also be removed for each one lost by this action.

Violation of the rules and regulations pertaining to amateur radio in the country of the contestant or the rules of the contest, unsportsmanlike conduct, or taking credit for excessive duplicate contacts or multipliers will be deemed sufficient cause for disqualification. Disqualified stations or operators may be barred from competing in CQ contests for a period of up to three years.

ENTRIES:

Sample log and summary sheets may be obtained from CQ by sending a large SASE with sufficient postage to cover your request. It is not necessary to use the official form, you can use your own. Logs should have 40 contacts per page and show time in GMT, numbers sent and received, and separate columns for QSO points and multipliers. Indicate the multiplier only the first time it is worked.

Include a summary sheet with your entry showing the scoring and other essential information, and a signed declaration that all rules and regulations have been observed. Mailing deadline for CW entries is Feb 28. Logs can be sent directly to the 160 Contest Director, Don McClenon N4IN, 3075 Florida Avenue, Melbourne FL 32901, USA. Alternatively, they can be sent to *CQ* 160-Meter Contest, 76 North Broadway, Hicksville NY 11801, USA. Please indicate "CW" on the envelope!

MICHIGAN YL QSO PARTY

Starts: 1800 GMT January 28
Ends: 1800 GMT January 29

Sponsored by The Auto State Young Ladies (TASYLs). No crossband, net, or repeater QSOs are allowed. Each station can be contacted only once.

EXCHANGE:

RS(T), QTH, and TASYL number (for members).

SCORING:

Score one point per QSO and multiply by 2 if on CW. Multiply again by 2 if TASYL member. Multiply QSO points by number of different ARRL sections and DX countries worked.

ENTRIES:

Send logs to TASYL President Carol Hall WD8DQG, 4651 Cardinal Dr., Mt. Pleasant MI 48858. Entries must be received by February 25th.

The TASYL Certificate may also be earned during the QSO Party for working TASYL members. Charter members 1 thru 50 count 2 points while all other members count 1 point. Michigan stations need 15 points while others only need 10 points. To apply for the award, send a signed and dated log showing the date and time of contacts, callsigns, frequencies, RST, and TASYL numbers. Certification giving date and QTH must be on the original application and signed by one of the following: 2 licensed amateurs, General-class or higher (non-family), one official of a recognized club, or a notary public. Include $1 to cover mailing costs, etc., and submit applications to Carol Hall WD8DQG, 4651 Cardinal Drive, Mt. Pleasant MI 48858.

3RD ANNUAL RTTY WORLD CHAMPIONSHIP

0000Z to 2400Z
February 25, 1984

SPONSORED BY:

73: Amateur Radio's Technical Journal and *The RTTY Journal*

OPERATOR CLASSES

(A) Single operator, single transmitter. (B) Multi-operator, single transmitter.

ENTRY CATEGORIES

(A) Single band. (B) Allband, 10-80 meters.

EXCHANGE

Stations within the 48 continental United States and Canada must transmit RST and state or province/territory. All others must transmit RST and consecutive contact number.

MISCELLANEOUS RULES

The same station may be worked once on each band. Crossmode contacts do not count. Single-operator stations may work 16 hours maximum, while multi-operator stations may operate the entire 24-hour period. Off times are *no less* than 30 minutes each and must be noted in your log(s).

QSO POINTS

5 QSO points for contacts with W/VE stations located within the continental United States and Canada. 10 QSO points for all other contacts.

MULTIPLIER POINTS

1 multiplier point is awarded for each of the 48 continental United States (a District of Columbia contact may be substituted for a Maryland multiplier). Canadian provinces/territories, and DX countries worked on each band (excluding US and Canada).

FINAL POINTS

Total QSO points times total multipliers equals *claimed score*.

CONTEST ENTRIES

Entries must include a *separate* log for each band, a dupe sheet, a summary sheet, a multiplier checklist, and a list of equipment used. Contestants are asked to send an SASE to the contest address for official forms.

ENTRY DEADLINE

All entries must be postmarked no later than April 15, 1984.

DISQUALIFICATIONS

Omission of the required entry forms, operating in excess of legal power, manipulating scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS

Contest awards will be issued in each entry category and operator class in each of the US call districts and Canadian provinces/territories, as well as in each DX country represented. Other awards may be issued at the discretion of the awards committee. A minimum of 25 QSOs must be worked to be eligible for awards.

CONTEST ADDRESS

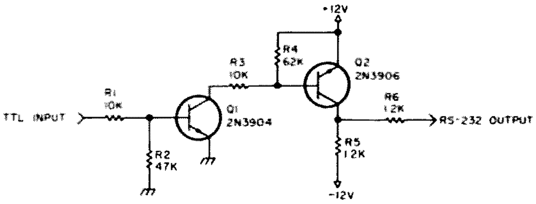
RTTY World Championship, c/o *The RTTY Journal*, PO Box RY, Cardiff CA 92007.

CIRCUITS

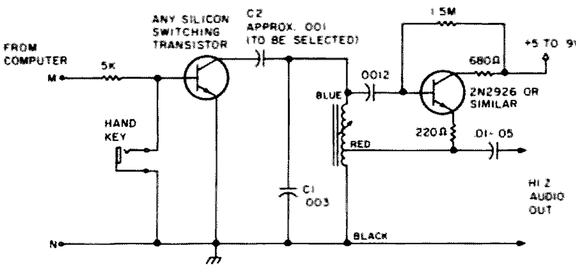
Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic it needed.

In exchange tor these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73* Magazine, *Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*

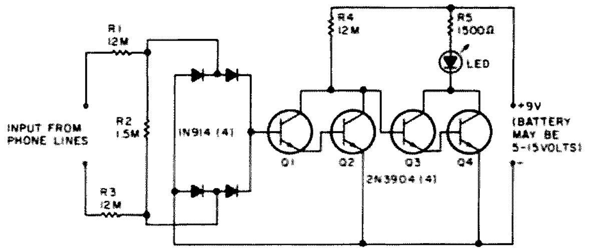
STOP THAT ICOM BUZZ: If your IC-45A has been buzzing through the speaker or has been commanding itself to start or stop scanning, here is a simple fix. The regulator (IC-2) on the main board is the power supply for the whole radio. If it is not securely attached to the heat sink and if the board on which it sits is not firmly attached to the framework, the regulator filter will not function correctly. This will allow a buzz into the 8-V supply and will false the CPU into thinking that there was a command. Buzz may also occur in the audio. By tightening the four screws holding IC-2 to the heat sink, the filter will be allowed to work again. Some of the screws have a tendency to loosen, so a periodic check of them is in order.—Rick Bates WA6NHC, Petaluma CA.



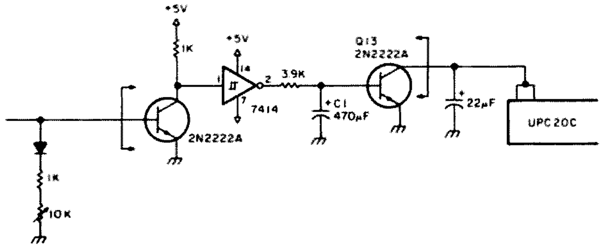
SIMPLE TRANSISTOR TTL-TO-RS232 INTERFACE: This circuit can be used for driving an RS232 printer or RTTY interface from your computer or digital circuit. Transistor Q2 is the ± 12-V switch, which is driven by Q1. When the TTL input is low (mark condition), Q1 is turned off, which allows Q2 to be turned off. The RS232 output rests at − 12 volts (mark condition). When the TTL input is logic high (5 V), Q1 turns on and drives the base of Q2, turning it on. The RS232 output will then go to approximately + 12 V (space condition). Resistor R6 maintains a current limit in the event of an RS232 output short circuit. If the output were shorted without R6 in the circuit, the switch transistor Q2 would quickly burn out. The total cost of this simple interface is 32 cents.—Scott M. Freeberg WA9WFA, Ft. Atkinson WI.



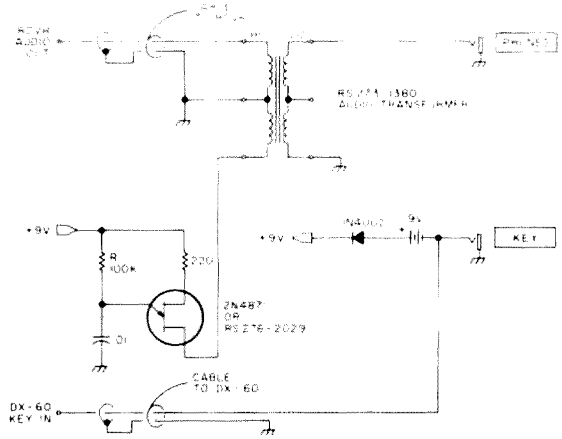
RTTY OSCILLATOR FROM ORGAN PARTS: Using a tapped coil from the tone generator in a Conn organ, this circuit will generate the necessary 1275 and 1445 tones for RTTY. The coil I used (no. 57013) produced F sharp in the sixth octave; it should be available from a Conn organ repairman. Other coils may be used instead, but you must change the value of C2 to get the correct frequency. The circuit itself is a standard Hartley oscillator, and the coil adjustment is a standard 6-32 nut. Be sure to finish tuning in the tightening mode to ensure mechanical stability.—Wm. Bruce Cameron WA4UZM, Temple Terrace FL.



TELEPHONE OFF-HOOK INDICATOR: How many times have you started to dial a phone number only to find that the line was already in use? This visual indicator will signal when another person is dialing or talking on an extension and also provides a visual ring indicator. The LED flickers when the phone is ringing or being dialed. It glows steadily when the phone is off the hook. R1 and R2 isolate the system from the phone lines. They form a voltage divider with R3. The divider output feeds switch Q1-Q2. The switch senses less than 2 uA which the system draws from the phone line. That small current drops about three volts across R2 which keeps Q2 turned on. That keeps the second switch, Q3-Q4, and the LED turned off. But when the phone is taken off the hook, the line voltage falls, Q1-Q2 turns off, and Q3-Q4 turns on and lights the LED. Voltage changes caused by ringing and dialing also affect the switching, causing the LED to flicker.—Evert Fruitman W7RXV, Phoenix AZ.



FAST-ATTACK SQUELCH: This circuit was designed to provide a high-performance squelch for a nearby repeater which uses an IC-22A as a receiver. The Schmitt trigger provides a little hysteresis where it takes more signal energy to open the squelch than it takes to close it. Replace Q13 with a 2N222A in a TO-18 package, and leave the base lead out of the circuit board so that a wire can be attached to it later. C1 must be greater than 100 uF to eliminate popping noise around the squelch threshold, but the other parts values are not critical.—Robert C. Lee WB0UBL, North Liberty IA.



CW SIDETONE FOR THE DX-60: Here's a simple circuit which will work with any receiver and create a sidetone when you are keying the DX-60. Transformer T1 is an audio transformer. The unijunction transistor used as an oscillator may be any type; a 2N4871 or RS 276-2029 are good choices. Battery drain is practically nil, so a power switch is not needed, and you can change the pitch of the sidetone by changing the value of R.—Terry Simonds WB4FXD, Edgartown MA.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 6

nology, I'll let you know what's going on. In computers, the big push is for lap micros—the size of a ream of paper, but a lot lighter. This editorial is being written on a Tandy 100 lap computer.

The first system on the market along this line was the Sony Typecorder. But after almost a two-year lead on the field, Sony dropped the ball. An old CB manufacturing firm in Japan went the next step, producing the Tandy 100. This came out last spring, made by Kyocera.

Oddly enough, I described this computer in rather good detail when I gave a talk at the Atlanta Hamfestival in 1976. Later that year, I went over the idea with K. Mishi, the editor of *I/O* magazine in Japan. He, I am told, worked with Kyocera on its development. My part has probably been forgotten by now, but then, I'm used to that. It was my idea for splitting channels onto videotape which brought the first breakthrough by Ampex back in 1948. I'm sure that my idea has been long forgotten, but it was the one thing they needed to get started with videotape. At the time, I was working as a television engineer for WPIX in New York. I attended a TV seminar and talked with the engineers at Ampex. They explained that they were only able to get part of the needed bandwidth on tape, so I suggested heterodyning the frequencies down to where they could be put on tape and then putting the frequencies back together again later. They tried it and soon after we had 2" videotape from Ampex. No one even said thanks.

The lap computer is going to be a very big business, with opportunities for small firms to develop accessories and software for them—thousands of firms. But the next step is one which should be duck soup for hams—getting rid of the umbilical cord so these small computers can access a nearby computer system and use its storage, disks, and so on.

The next step, as I have written before, is a communications system which will allow all the desktop and lap computers to almost instantly communicate with each other. Something along the line of our repeater systems, which would receive messages, check them for errors and roger them, then pass them along to the addressee, complete with a return roger of the message receipt, is so obvious that it will have to happen.

In a few years, any of us who want to will be able to communicate with anyone anywhere from anywhere. It won't make any difference if I am walking along the street, shopping in Singapore, or in New Hampshire on a ski slope—I'll be able to type or talk a message and have it delivered in a second or two anywhere to anyone.

This is going to change business beyond recognition. It is going to have a profound effect on education. We can't even imagine what it will do for personal relationships. Oh, busy people will have to have filters built into the system. When my business was small I was available by phone at any time of the day or night. Today I'd be driven crazy with stockbrokers wanting to help me with my "portfolio" and investment counselors wanting to help me with my estate—not to mention people with investment ideas for my money and so on.

This communications demand is going to call for hundreds of thousands or even millions of technicians, engineers, and scientists to develop, manufacture, sell, install, operate, and service the systems it will take to do all this. It's mind-boggling in concept. We'll be using fiber optics, lasers, microwaves, satellites, and anything else we can invent to speed things up and make them less expensive. Amateurs are in a beautiful spot to get in on this bonanza. We can develop the communications system to do these things on our ham bands and then get started with small businesses, taking advantage of what we've developed. Or, we can bicker over the Morse code, get into pileups fighting for DX, and jam nets. I'm not sure these activities are any more beneficial to the world—or to amateur radio—than sitting back with two six packs of 807s and watching football on television.

The potential is there. My magazines can help you take advantage of that potential. Indeed, it is as a direct result of the pressures at Dayton, where hundreds of hams pleaded for a good Commodore magazine, that we've launched *RUN*. The first issue is due out in December and it looks as if it will sell well over 100,000 copies right off the bat.

I have a bunch more magazines in various stages of getting started just in case you don't smoke and are interested in getting involved in high-tech publishing. Some are in computers, some aren't.

Speaking of new magazines, while in Munich for the huge systems show (24 big buildings full of computer exhibits), we had a launching party for *PC Welt*, a German version of our sister magazine, *PC World*. Then on to Tokyo for the Data Show and the launching of a PC magazine there. A day later in Singapore, at a third computer show, it was *Computerworld Asia* getting started. And finally, after flying around the world and covering 32,000 miles in ten days, Comdex in Amsterdam and the launching of ***MicroInfo***, a Dutch micro magazine—another associated publication of ours. Whew, what a trip!

With sunspots diminishing for several more years, DX is going to be harder to work and our higher bands are going to be of less interest. This seems like the ideal time for us to get cracking on new technologies—to experiment with new modes of communications and pioneer them.

Will we see automatic identification of rigs this year? It's certainly within our current level of technology to do this, complete with a reader on every receiver which will instantly read out the call of the received station—or even search for a desired station prefix.

With the development of packet communications, we may start having automatic message handling. We could have done that thirty years ago when I first started working with digital communications on the ham bands, but our national organization has done little to encourage such changes—and much to discourage them.

I'll be continuing to get on 20m as much as I can—and 2m from the various cities I visit. Sure, I'll be at Dayton this year. I don't know which other hamfests I'll make as yet. I've gotten to a lot of shows in the last year—consumer electronics shows in Tokyo, Seoul, Taipei, Hong Kong, and Vegas—computer shows in Anaheim, Tokyo, Taipei, Singapore, Munich, Amsterdam, Atlanta, Boston, New York, and so on. This year I'll be hitting more hamfests—hope to see you.

INTERNATIONAL CORRESPONDENTS

First, I'd like to thank the hundreds of readers who have called or written to say that this feature is a favorite. We have 52 countries with correspondents and need more. I'll do what I can to find 'em as I travel, but you can help, too, by mentioning it over the air to some of the more interesting DX operators you get to know.

Some of the columnists have a tough job getting the information through—such as from Poland, for example. We really appreciate the job they're doing.

We have a truly international hobby and this column helps to bring us all together. We're interested in news of expeditions, special operations, certificates, how visitors can get permission to operate, how easy or difficult it is to get a license for locals, and so on.

With its international column, *73* has become the first international ham magazine.

PRICE INCREASE

With a substantial increase in the international distribution of *73*—increased by 35,000 copies—we've had to increase the cover price from $2.495 to $2.50 so as not to drive foreign newsstands right out of their minds. We had enough trouble in America—worth every minute of it, by the way.

Speaking of DX, have you chosen a DX operator to send a subscription to?

BARTER 'N' BUY

73 CLASSIFIED ADVERTISING

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Commercial .... 50¢ per word

Prepayment by check or money order is required with your ad. No discounts or commissions are available. Please make your payment to *73*. Rates for multiple insertions are available on request.

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Advertising must pertain to amateur radio products or services. No special layouts or positions are possible. All advertising copy must be submitted typewritten (double-spaced) and must include full name and address. Copy limited to 100 words, maximum. Count only words in text. Address, free.

73 cannot verify advertising claims and cannot be held responsible for claims made by the advertiser. Liability will be limited to making any necessary correction in the next available issue. *73* reserves the right to reject any copy deemed unsuitable.

DEADLINES

Copy must be received in Peterborough by the 5th of the second month preceding the cover date. If copy is received after the deadline, it will be scheduled to run the following month, unless specifically prohibited by the advertiser.

MATERIALS

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SATELLITES

Amateur Satellite Reference Orbits

Date	OSCAR 8 UTC	OSCAR 8 EQX	RS-5 UTC	RS-5 EQX	RS-6 UTC	RS-6 EQX	RS-7 UTC	RS-7 EQX	RS-8 UTC	RS-8 EQX	Date
Jan 1	0014	94	0001	226	0122	253	0000	229	0124	245	1
2	0018	95	0155	257	0107	251	0149	258	0121	246	2
3	0022	96	0150	257	0052	249	0140	257	0118	246	3
4	0027	97	0145	257	0036	247	0130	256	0115	247	4
5	0031	98	0139	257	0021	244	0120	255	0112	248	5
6	0035	100	0134	257	0005	242	0111	254	0109	249	6
7	0040	101	0129	257	0149	269	0101	253	0107	250	7
8	0044	102	0123	258	0133	267	0052	252	0104	250	8
9	0048	103	0118	258	0118	265	0042	252	0101	251	9
10	0053	104	0113	258	0102	262	0032	251	0058	252	10
11	0057	105	0107	258	0047	260	0023	250	0055	253	11
12	0101	106	0102	258	0032	258	0013	249	0052	254	12
13	0106	107	0057	259	0016	255	0003	248	0050	255	13
14	0110	109	0051	259	0001	253	0153	277	0047	255	14
15	0114	110	0046	259	0144	280	0143	276	0044	256	15
16	0119	111	0041	259	0129	278	0133	275	0041	257	16
17	0123	112	0035	259	0113	276	0124	274	0038	258	17
18	0127	113	0030	260	0058	274	0114	273	0035	259	18
19	0132	114	0024	260	0042	271	0104	273	0033	259	19
20	0136	115	0019	260	0027	269	0055	272	0030	260	20
21	0140	116	0014	260	0012	267	0045	271	0027	261	21
22	0002	92	0008	260	0155	294	0036	270	0024	262	22
23	0006	93	0003	261	0140	292	0026	269	0021	263	23
24	0010	94	0157	291	0124	289	0016	268	0018	263	24
25	0015	95	0152	291	0109	287	0007	267	0016	264	25
26	0019	96	0147	291	0053	285	0156	296	0013	265	26
27	0023	97	0141	291	0038	282	0146	295	0010	266	27
28	0028	98	0136	291	0022	280	0137	294	0007	267	28
29	0032	99	0131	292	0007	278	0127	294	0004	268	29
30	0036	101	0125	292	0150	305	0117	293	0001	268	30
31	0041	102	0120	292	0135	303	0108	292	0158	299	31
Feb 1	0045	103	0115	292	0120	300	0058	291	0156	300	1
2	0049	104	0109	292	0104	298	0048	290	0153	301	2
3	0054	105	0104	293	0049	296	0039	289	0150	302	3
4	0058	106	0059	293	0033	294	0029	288	0147	303	4
5	0102	107	0053	293	0018	291	0020	287	0144	303	5
6	0107	108	0048	293	0003	289	0010	286	0141	304	6
7	0111	110	0043	293	0146	316	0000	286	0139	305	7
8	0115	111	0037	294	0130	314	0150	315	0136	306	8
9	0120	112	0032	294	0115	312	0140	314	0133	307	9
10	0124	113	0027	294	0100	309	0130	313	0130	307	10
11	0128	114	0021	294	0044	307	0121	312	0127	308	11
12	0133	115	0016	294	0029	305	0111	311	0124	309	12

MOBILE IGNITION SHIELDING. Free literature. Estes Engineering, 930 Marine Drive, Port Angeles WA 98362. BNB006

DEALERS IN SURPLUS test instruments, microwave equipment, and components. WANTED: late test equipment (H.P., TEK, G.R., Narda, etc.), waveguide diagonal coax components. Immediate needs: H.P. K382A, R382A, S382C, 432A; G.R. 874- and 900-series coax items. Request want list. LECTRONICS, 1423 Ferry Avenue, Camden NJ 08104. Telephone (609)-541-4200. BNB015

WANTED: Early telegraph instruments for my collection. Keys, sounders, call boxes, registers, meters, and related items including pre-1910 paper. Larry Nutting WD6DTC, 5957 Yerba Buena, Santa Rosa CA 95405. BNB018

COLOR COMPUTER owners—call (212)-441-2807 for FREE color computer hardware and software catalog or write to Spectrum Projects, 93-15 86 Drive, Woodhaven NY 11421. BNB023

FOURTH ANNUAL Ohio State Convention and Flea Market: Join in the even bigger "Cincinnati ARRL '84," February 25 and 26. Activities for hams and electronics enthusiasts: forums, meetings, vendors, Wouff Hong, women's activities, banquet, hospitality suite, more. Sure cure for "cabin fever." Hospitality suite Friday and Saturday nights. The $5 convention registration includes all convention awards. Flea market is $4/space for two days—ham and electronics items, only. Write: Cincinnati ARRL '84, POB 11300, Cincinnati OH 45211 or telephone (513)-825-8234. Vendor and exhibitor inquiries invited. BNB024

KENWOOD 7625 2-meter transceiver, synthesized/memory, 25 Watts, $135. Kenwood TS-130V, $75. Turner Plus Two amplified mike, $35. D-104 amplified mike, $35; unamplified, $25. Vista IV 4-Amp unregulated 12-volt power supply, $16. Earl W. Long KAØMOE, Box 955, Joplin MO 64802-0955. No telephone calls please. BNB025

FREE SAMPLE—send stamp. Buy/sell radio, computer equipment in "Electronic Exchange," Box 486E, Forest Lake MN 55025. BNB026

CABLE, CONNECTORS, Fittings, 50 & 75 Ohms. Bought storage room full new ham/cable TV hardware. Send SASE & $.50 for big list. Pete WB3BQO, 329 Little Ave., Ridgway PA 15853. BNB027

DXERS—DX headings centered on YOUR QTH. $3.00 pp. KENTRONICS, PO Box 586, Vernon AL 35592. BNB028

AZDEN SERVICE MANUALS, PCS 3000 and PCS 300—$5.00 each; PCS 4000—$9.00. N.P.S., 1138 Boxwood, Jenkintown PA 19046. BNB029

WANTED: Cash paid for used SPEED RADAR EQUIPMENT. Write or call: Brian R. Esterman, PO Box 8141, Northfield IL 60093; (312)-251-8901. BNB030

MILITARY RADIO GEAR turns me on—I particularly crave more German, Japanese WW2 gear, UK sets, type #18, 21, 22, 48, Canadian RCAF AR-6, other non-US items. Also US types GRC-109, PRC-1 through 5, RAX, RBD, RBM, TRC-2, 10, others through 1950s, except post-1945 FM/VHF. I collect/restore/operate this vintage gear, so please dig out those dusty green and black boxes, accessories, manuals, etc. Tnx! Hugh Miller KA7LXY, 11206-1 NE, Seattle WA 98125. BNB031

RTTY FDM DEMODULATORS. FDM RTTY exists on satellites, FM SCA broadcast subcarriers (e.g., Commodity News Service), and HF radio. Four solid-state synthesized models, NSA surplus, new-used, $50 to $350. Call/write for brochure. Electrovalue Industrial, Inc., Box 376-WF, Morris Plains NJ 07950; (201)-267-1117. BNB032

PALOMAR ELECTRONICS CORPORATION EQUIPMENT REPAIR—2 techs, factory-trained, FCC-licensed, experienced, professional. Also available—Palomar equipment service manual—covers over 30 models. Communications Service, PO Box 3262, Escondido CA 92025. BNB033

ATLAS RADIO REPAIR—Specializing in the 180-210x-215x. Factory-trained, fast, experienced, reasonable. Payne Communications, PO Box 977, Vista CA 92083. BNB034

RTTY FOR THE TI99/4a. Mini-memory required. Mark and space tones are internally generated in send mode. TU is needed for receive only. $17.95. Mark Schmidt, 4661 Lark Dr., Beale AFB CA 95903. BNB035

PSST! HEY, wanna make professional-quality printed circuit boards? One or more in only 60 minutes. Simple, inexpensive, new system. Free 1984 catalog. PINCOR, 530 Palace, Aurora IL 60506; (312)-896-0015. BNB036

✓See List of Advertisers on page 114

73 INTERNATIONAL

from page 80

1914 km on 1296 MHz and 1663 km on 10 GHz!

Last summer that worldwide-known GHz DXer bettered a fantastic world record of 1166 km on 10 GHz from Sagunto, Spain, to Italy. On July 2nd, Nicola joined IØSC and IØKBL in Ceuta. With them was Bernardo EA5RK. Nicola's car hauled a trailer with gear for 144 MHz, HF, and the GHz transceivers.

They met many hams from Ceuta, EA9LT, EA9GH, EA9KF, EA9LV, and EA9GH, who gave their assistance, providing permission to install the setup and the antennas on the Ceuta lighthouse, 400 feet above sea level.

● July 4—Nicola starts with two QSOs on 144 MHz MS, contacting I4BXN and F6FHI.

● July 5—There is an E-sporadic aperture: Nicola contacts on 144 MHz several YUs and Is with signals far in excess of S9. These are the first EA9-YU QSOs in history. At 1507Z, a contact is established on 1296 MHz with I8TUS/8. The QRB is 1914 km, a world record.

● July 6—At 1052, an ES contact with 9H1CG, a new one on 144 between EA9 and 9H. Then dozens of ES contacts with Italy and Yugoslavia. The signals are terrific: The S-meter is pinning up to full scale. At 1804, another new one with G4IJE; then, at 1845, GI4TAP (first QSO EA9-GI); at 1847, EI2CA, and at 1917, GW8FKB (two new ones with EA9).

● July 7—A one-hour opening on 1296 and many QSOs with Sicily. IØHOC/IT9 displays in Ceuta a signal of S9+20. Giuseppe has gone portable from Rome to Sicily just to try the contact!

Then the magic moments: At 1600, the contact is established with fair signals with IWØBCU/IT9, France, with a QRB of 1621 km! After seven minutes, again the record with IØNLK/IT9. The entire Roma Microwave Gang was in Sicily to attend the IØSNY enterprise.

Three hours after the record is filed, a new contact with IØNLK/IE9, Isle of Ustica, brings the record to 1663 km, almost 500 km more than the 1982 record from Sagunto to Rome. The day is not ended, as IWØBHN is contacted on 10 GHz: 1603 km, not a record but great DX!

● 9 and 10 July—The team is now in Morocco and gets several new contacts from that country on 144 and 432 MHz. But the most interesting QSO is the contact with IØHOC/IT9 on 1296: two hours of conversation with steady signals of S9+40 dB, full scale! Nicola then tries FM: S9+40 again!

Too many bureaucratic difficulties in Morocco, so IØSNY and his friends leave for Perugia, the nice, historical, small city where he lives, in central Italy.

Boys, let's see what he will do next summer!

ITALIAN CALL AREAS

I1, IK1, IW1*	Liguria and Piemonte (N.W. Italy)
I2, IK2, IW2	Lombardia (N. Italy)
IX1, IW1	Valle d'Aosta (N.W. Italy)
I3, IK3, IW3	Veneto (N.E. Italy)
IN3, IW3	Trentino Alto Adige (N.E. Italy)
IV3, IW3	Friuli Venezia Giulia (N.E. Italy)
I4, IK4, IW4	Emilia (N. Italy)
I5, IK5, IW5	Toscana (C. Italy)
I6, IK6, IW6	Marche and Abruzzi (C.E. Italy)
I7, IK7, IW7	Puglia (S.E. Italy)
I8, IK8, IW8	Molise (S.E. Italy)
I8, IK8, IW8	Basilicata, Calabria, Campania (S. Italy)
IT9, IW9	Sicily (S. Italy)
IØ, IKØ, IWØ	Lazio (C.W. Italy)
IØ, IKØ, IWØ	Umbria (C. Italy)
ISØ, IWØU	Sardinia (W. Italy)

* The IW prefix is for special no-code license, 144 MHz and up.

ITALIAN ISLANDS AWARD (IIA)

The Italian Islands Award is issued by ARI (Associazione Radioamatori Italiani) to all radio amateurs and SWLs worldwide. The award can be obtained on the following frequencies and with the follow-

ITALIAN ISLANDS AWARD

List of the islands and points. (To save space, only the points achieved on the HF bands are indicated. There is a different point scale for the contacts on other bands (VHF, UHF, up 3 GHz). The complete point table can be requested from the ARI Award Manager with an SASE.

Isole Liguri—IA4

Palmaria	2
Tino	3
Tinetto	4
Gallinara	3
Bergeggi	2

Arcipelago Ponziano—IBØ

Ponza	1
Gavi	2
Botte	5
Cappello	5
Formiche	5
Le Galere	5
Mezzogiorno	5
Palmarola	3
Piatti	5
S. Stefano	2
Ventotene	1
Zannone	2

Arcipelago Napoletano—IC8

Ischia	1
Procida	1
Li Galli	4
Nisida	4
Vivara	1
Capri	1

Isola di Ustica—IE9

Ustica	1
Banco Apello	2
Colombara	2
Medico	2

Isole Pelagie—IG9

Lampedusa	2
Lampione	3
Linosa	3
Isola Conigli	5

Isola di Pantelleria—IH9

Pantelleria	1

Arcipelago Toscano—IA5

Elba	1
Corbella	2
Gemini	2
Meloria	2
Ogliera	2
Ortano	2
Palmarola	1
Remaiolo	2
Scoglietto	2
Sedia Paolina	2
Scoglio Africa	3
Topi	2
Triglia	2
Gorgona	1
Montecristo	3
Pianosâ	2
Cerboli	2
Falconcino	2
Santa Lucia	2
Capraia	1
Giannutri	2
Giglio	1
Argentarola	3
Formica Burano	2
Formiche	2
Isola Rossa	2
Isolotto	3
Sparviero	2

Arcipelago delle Eolie—ID9

Lipari	1
Alicudi	1
Filicudi	1
Canna	5
Montenassari	3
Panarea	3
Basiluzzo	3
Battara	3
Dattilo	5
Formiche	3
Lisca Bianca	3
Lisca Nera	3
Panarelli	3
Spinazzoia	3
Saiina	1
Stromboli	1
Strombolicchio	2
Vulcano	1

Arcipelago delle Egadi—IF9

Asinelli	5
Porcelli	5
Favignana	1
Formica	2
Galeotta	5
Maraone	2
Preveto	5
Levanzo	1
Marettimo	1

Arcipelago Cheradi—IJ7

San Paolo	2
San Pietro	2

Isole Tremiti—IL7

San Domino	1
San Nicola	1
Caprara	2
Cretaccio	2
Pianosa	4

Arcipelago della Maddalena—IMØ

Maddalena	1
Barrettini	2
Biscie	2
Budelli	2
Cana	4
Caprera	1
Cavalli	3
Corcalli	2
La Presa	2
Monaci	2
Piana	2
Porraggia	2
Porco	2
Ratino	2
Razzoli	2
Santa Maria	2
Santo Stefano	2
Spargi	2
Spargiotto	4
Asinara	2
Cappuccini	4
Della Bocca	4
Figarolo	4
Foradada	4
Delli Nibani	4
Poveri	4
isolotto Rossa	4
Le Camere	4
Le Soffi	4
Maddalena Alghero	4
Marmorata	4
Molara	2
Molarotto	5
Mortorio	5
Mortoriotto	5
Pagliosa	4
Pecora	4
Pedrami	4
Piana di Alghero	4
Porri	4
Proratola	4
Rossa	4
Rossa di Bosa	4
Ruja	4
Scoglio Businco	5
Corona Niedda	5
Scoglio Forani	5
Scoglio Paganetto	5
Tavolara	2

Arcipelago Cagliari—IMØ

Cavoli	4
Corno	4
Il Toro	2
La Vacca	2
Mal di Ventre	2
Meli	4
Ogliastra	4
Piana S. Pietro	4
Quirra	4
Ratti	4
Rossa Teulada	4
San Macario	4
San Pietro	1
Sant'Antioco	1
Serpentara	4
Tuaredda	4
Variglioni	4

Isole di Oristano—IMØ

Scoglio La Ghinghetta	5
Scoglio Mangiabarche	5
Scoglio Pan di Zucchero	5

Sardegna—ISØ	1
Sicily—IT9	1

Minor Islands

Prefix I3	1
Prefix IV3	1
Prefix I7	3
Prefix I8 (Sicilian)	1
Prefix IT9	4

ing modes: Frequencies: HF, VHF, UHF, microwaves above 3 GHz. Modes: SSB, CW, mixed, RTTY.

To obtain the award, the amateurs/SWLs must work/hear Italian islands to obtain the following score: DX—10 points; EU—20 points; Italy—40 points.

Contacts are valid starting from January 1, 1970.

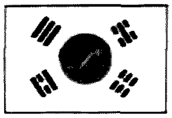
Points must be calculated following the list (see box). Different islands of the same archipelago can be contacted, and the points achieved added up. The same island of the same archipelago can be worked on different bands and modes, i.e., five different contacts with the same island but on five different bands count 5 × points assigned to that island.

Honor Roll—This endorsement is achieved with a minimum of 60 points.

5BIIA—To obtain this award, 10 contacts must be made with islands or groups of islands on 5 HF bands.

The IIA must be requested from the ARI Award Manager, Via Scarlatti 31, 20124 Milano, Italy. It is not necessary to send QSL cards; a list log-formed is sufficient. The QSL cards must be in the possession of the applicant and should be sent if requested by the Award Manager.

Fee: Any application must be sent with US $8.00 or 30 IRCs.



KOREA

J. Michael Wengert HL9KT
c/o ABC News
CPO Box 2961
Seoul
Korea

Amateur radio operators in Korea were surprised recently to receive letters from the "Korean Radio Operators Association," a group of professional radio operators, requesting them to mail fees to the organization and to make their stations available for inspection. Apparently, the Korean Ministry of Communications (MOC), which is responsible for issuance of all commercial and amateur radio licenses and for inspection of all classes of radio transmitting stations, has decided that the annual inspection required for all amateur stations for license renewal will be conducted by the professional organization and not by KARL (Korean Amateur Radio League). KARL had all but announced that they would soon be taking over inspection of amateur stations from the MOC. The reason for turning over the inspection responsibility to an outside organization was given as the "excessive workload" imposed by the growing number of new ham stations in Korea.

This decision from the MOC was yet another blow to KARL, which already was smarting from suspicion and criticism from its members following a procurement scandal. Early this year, a general-affairs director of KARL was relieved of his official duties when it was learned that his position was used to gain exclusive import rights for Japanese-made transceivers for a certain Korean import company whose president was a close friend of the KARL president, National Assemblyman Lee Min Sup. Lee was not directly implicated in the matter, but the incident has yet to be resolved to the satisfaction of KARL members as Lee repeatedly overruled attempts by individual members to bring up the matter for discussion at the KARL annual meeting last April.

Other matters for which KARL is under attack by its members include high fees charged for membership compared to that of other countries. Membership in the League is compulsory for all amateur radio operators in Korea and annual dues must be paid up in advance (US$30) before the KARL president's seal may be applied to applications for annual renewal of the station licenses. The annual inspection fee comes to another $22 (average). This, coupled with high customs duty and local taxes, makes amateur radio in Korea a pastime for rich people.

Attempts by KARL to get mobile/portable operation reinstated have failed. A League source, who prefers to remain anonymous, blames Korea's security agencies for blocking the approval.

Although the total number of amateurs in Korea is on the increase, the number of active hams, especially on the HF bands, is not increasing proportionately. Korea has a Radiotelephone Class license (no-code Novice) which permits phone operation on 80, 40, 15, and 10 meters plus VHF and is relatively easy to get. As a result, many Koreans soon lose interest, sell their rigs, and buy microcomputers, a phenomenon observed in neighboring Japan which also has a box-top, no-code license.

HL9 operation by United Nations Command-affiliated personnel continues, but attempts to get on the new Phase III bird are thwarted by the unavailability of 430 MHz. More on the HL9s and the American Radio Club in Korea next month. 73 from the Land of the Morning Calm.

LIBERIA

Brother "Don" Donard, Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
Monrovia
Republic of Liberia

What is a developing country—in amateur radio?

This question is under consideration by a committee of the Region I Division Conference of The International Amateur Radio Union. When this question has been decided, they will study a proposal "To establish a means of funding, and guidelines for effective operation for the Promotion of Amateur Radio in the Developing Countries."

Here is another quote: ". . . for example, in Liberia there are 67 licensed amateurs of which 26 are members of the Liberian Radio Amateur Association (LRAA). Of the 67, only 10 are indigenous Liberians."

Here in Monrovia, we have just finished a course in amateur radio. Out of a hundred and twenty students who registered for the course, twenty-six came in to sit for the examination. Of these, four passed the General test and four passed the Novice test.

We are a developing country. There is no lack of interest, and the data given above is enough evidence of that. The data given above might also be an indication of the handicaps under which we and the students must work. It takes a lot of courage for a high school student or an adult to study amateur radio without a textbook or a code oscillator.

We are very much encouraged by the fact that the Region I Conference is aware of our problems and is actively engaged in an effort to solve them. They propose to set up a resource center that will make available all kinds of instructional materials. They will stock printed materials that are either donated or that are obtainable free of charge and will appropriate an ongoing fund to purchase instructional materials and to pay shipping charges. They are even exploring the possibility of providing instructors if they are not otherwise available.

This is an ambitious idea but it can work, and if it is handled in the manner in which amateurs traditionally handle their undertakings, it will indeed do what it is supposed to do. It will succeed.

One can only guess what is happening in other developing countries, but here in Liberia there is real promise of progress. We have, at the present time, five places, all of them school locations run by missionaries, where there is one (in some cases more) dedicated person ready to conduct classes in amateur radio even under existing conditions. If we can apply to the Region I committee, or to anyone else for that matter, for essential teaching materials, it would increase very much the effectiveness of our work.

MEXICO'S NATIONAL EMERGENCY NET

DIRECTOR
National Emergency Coordinator
Special Events Coordinator
VHF Coordinator
Public Relations Coordinator
Treasurer
Secretary

Region # 1
North Baja Calif.
Sinaloa
South Baja Calif.
Sonora

Region #2
Chihuahua
Durango

Region #3
Coahuila
Nuevo Leon
Tamaulipas
San Luis Potosi
Zacatecas

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Nayarit

Region #5
Mexico City
Hidalgo
Mexico State
Queretaro

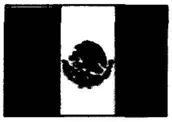
Region #6
Chiapas
Morelos
Guerrero
Oaxaca

Region #7
Puebla
Tlaxcala
Tabasco
Veracruz

Region #8
Campeche
Quintana Roo
Yucatan

EMERGENCY FREQUENCIES OF THE MEXICAN NATIONAL EMERGENCY NET

Phone	3,680 MHz	Code	3,690 MHz
	7,020 MHz		7,060 MHz
	14,040 MHz		14,120 MHz
	21,060 MHz		21,180 MHz
	50,040 MHz		50,040 MHz
	144,500 MHz		144,500 MHz



MEXICO

Mark K. Toutjian XE1MKT
Apartado Postal 42-048
06470 Mexico, D.F.

MEXICO'S NATIONAL EMERGENCY NETWORK

One of the many activities that has been developed over the years here in Mexico, as in many countries, is the cooperation among many ham radio operators during catastrophes, natural disasters, and airplane accidents, as well as work on problems with mobiles (auto and maritime). In 1943, a communications net known by the name of The Emergency Chain of Ham Radio Operators of the Southeast was established in order to provide auxiliary services along the coast of the Gulf of Mexico, principally in the State of Veracruz. It was formally accepted in 1949 due to the aid of many national hams.

Later on, in 1960, a group of ham operators who were members of the Mexican Radio Experimenters League undertook the labor of forming a nationwide emergency network that would also be tied in with emergency networks in other countries. Frequencies were then established (see box for current frequencies being used). This National Emergency Network was fully organized finally by 1963. One of today's most leading authorities or representatives of the network is Pablo A. Mooser XE1SR who serves as president of the Mexican Radio Experimenters League at the present.

Organizational Structure

In order for this National Emergency Network to function well, it is obvious that an administrative staff is very necessary (see box). This is composed of its director and six additional positions in order to coordinate things fully. Under this administrative staff, the country is divided into eight different regions or zones, each with its own Regional Coordinator. Within each region or zone there are various states, each with its own State Coordinator. These coordinators have in mind the development of special programs for members of the net so as to be able to function efficiently under most emergency situations. (This is very similar to emergency networks in other countries.) The structure may be of use to some of you who plan on organizing an emergency network in your own country where ham activities are starting to boom.

Certificates Available from the Network

Mexico's National Emergency Network

encourages new membership and more cooperation by means of authorizing three different certificates yearly. This is done by calculating individual attendance figures during each year. First, one has to be a member of the net. This organized transmission takes place daily at 2100 GMT on 3.690 MHz and on the 2nd and 4th Sundays of each month at 1000 GMT on 7.060 MHz. (The frequency chart shows frequencies to use when disaster strikes; they are used frequently for get-togethers.)

1) The first certificate is available for having attended 50 sessions with the net during the year (once a week).

2) The second certificate is available for having attended 150 times during the year (three times a week).

3) The third and last certificate is available for having been on frequency and reported your call 300 times during one year (six times a week).

The National Emergency Network can and has already presented different members with special certificates upon having participated in and resulting in outstanding performances during emergencies, catastrophes, or in special situations requiring aid.

You are possibly asking yourself: "How can I be a member?"

Membership

In order to become a member, you must have attended at least 24 sessions of the net during a year (at least once every two weeks). This certificate is valid for one year and is renewable upon attending another 24 sessions as mentioned above.

As was mentioned, many activities are planned by the National Emergency Net each year, and here I could mention that the different radio clubs throughout the country work in harmony with the net and also plan special events such as DXpeditions and other activities for the advancement of ham technology.

Special Note to Regional and State Coordinators in Mexico

Upon planning your future activities, I would appreciate it very much if you would send me an outline of such events and other pertinent information that may be of interest to *73* readers! Gracias!

THE NETHERLANDS

Henk Meerman PD0DDV
Zandvoorterweg 33
2111 GR Aerdenhout
The Netherlands

FIFTEENTH DNAT

From the 26th to the 28th of August of this year, the DNAT was held. The DNAT means Deutsch-Niederlandische Amateurfunktage (the German-Dutch Amateur Radio Days).

These days are organized by two Dutch amateur radio unions and one German, namely the VERON, the VRZA, and the DARC.

This annual Dutch-German meeting was held this year for the 15th time, in the beautiful city of Bad Bentheim, which is located near Almelo (The Netherlands), just a few kilometers over the Dutch border in Germany. Every year the Dutch and German hams and their families come from miles around to meet one another in Bentheim.

This year also the DNAT was a great success and hundreds of hams were present. Also yours truly was there with his YL to see what was on the program this year.

The flea market at Bad Bentheim.

My first pleasure was to fill up the tank of my car with much cheaper German gas. The difference is about thirty cents a liter! My second pleasure was to find a good camping spot near Bentheim. The thought of taking a hotel during these days you can forget, because all the hotels are fully booked. Anyway, I was glad that I took my tent along because we had extremely high temperatures for our kind of climate and for this time of the year.

We arrived at Bentheim on Friday evening, and because I was a bit tired of my work and I have to drive from the west side of my country to the east side, we had a few drinks and went to sleep.

The next morning my YL, friends, and I checked in at the DNAT office, located in the DARC (German Amateur Radio Club) building. We paid our registration fee and received badges with the DNAT sign. By paying the fee, entrance to all activities was free. We even had free entrance to the Bentheimer Casino and we could visit the Amateur Radio Museum. We also drove out of town and went to the castle of Bentheim. Afterwards we had a look at the flea market; you never know what bargains might be found.

So we took a very close look at all the stands. The place was so crowded that I and my friends kept in contact via our HTs—otherwise we would have lost each other. Since we all came in one car, the thought of losing one other was not a pleasant idea!

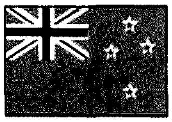
There was much to see, from pieces of junk to complete HF lines with reasonable pricetags. I bought some spare tubes for some receivers; the price of one tube was one mark. What can you buy for one mark these days?

After the flea market full of "sonderangebot," as the Germans call it, we had a look in the large school building where a number of German dealers had their stands. All the big names in ham equipment were present, and often these dealers had special DNAT prices. We bought some antenna stuff.

In the evening we went to a large hamfest in the garden of the castle of Bentheim, where we could dance to the music of a combo. On Sunday morning we packed up our things and went home again. It all was a great success, and I promised myself and my YL that we'll be there again next year.

NEW RULE

A new rule in Dutch amateur radio license conditions requires that all hams make a complete inventory of all the transmitters they own. This list has to be in the station's logbook and must include serial numbers, date of selling or purchase, type of equipment, power output, and name and address from whom the rig was bought and to whom the rig was sold. So, in the future, all Dutch hams will need an accountant to keep papers in order. (Hi).



NEW ZEALAND

Des Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

This month I shall explain about the birth of the Amateur Radio Emergency Corps of the New Zealand Association of Radio Transmitters.

THE 1931 EARTHQUAKE

"There can be, at this time, no more topical or important subject than the calamitous earthquake that has almost razed to the ground the towns of Napier and Hastings. The day of February 3rd, 1931, will remain for long a day of grief and consternation for the country as a whole, even as for years the date '79 A.D.' was significant for the annihilation of the cities of Herculaneum and Pompeii by Vesuvius."

So went the editorial from *Break-In* for the month of February, 1931. It goes on to extol the feats of two local Hawkes Bay amateur radio enthusiasts from Napier and Hastings who were able to transmit messages to the outside world of the tragedy of that day. ZL2GE (George Tyler) and ZL2BE (Jim Mills) provided the only communications links with places outside the earthquake-affected area in those early few hours after the first shocks at 10:50 that morning.

There were some other radio stations on board ships in the harbor which were able to call for help, too, but the amateur stations were operating from the centers of the two stricken cities. Both stations were battery operated and had contact with other amateur stations. Early in the emergency, the New Zealand Post and Telegraph Department requisitioned the amateur stations at Napier and Hastings as well as an amateur station in Wellington so that there were communications links available for emergency traffic in the first 24 hours after the calamity and until the telegraph and telephone lines were repaired and normal communications were restored.

THE RADIO EMERGENCY CORPS

That very briefly indicates the happenings of the 1931 February day when the earthquake struck. As a direct result of the success of the earthquake amateur radio communications network, the New Zealand Association of Radio Transmitters formed the Radio Emergency Corps in March, 1932.

Previously, about 1930, as a result of suggestions at a Headquarters meeting, a form of communications network was set up under the name of the Guard System and introduced in March, 1931. Guard stations were rostered two nights each week to operate a traffic net between HQ and the Branches of NZART. Rosters were published in *Break-In* and the NZART *Journal*, and the Guard System operated from 6:30 pm to 10:00 pm, Monday to Friday, and 6:00 pm to 11:00 pm, Saturday and Sunday.

It was intended that in times of an emergency, all Guard Stations would stand by for the Control Guard Station in the District affected by the emergency and handle any traffic as required. This Guard System gave the members practice in handling messages on the air and established a link between HQ and the Branches. The system was most successful, and many messages were transmitted and received every week on a scheduled basis. However, in due course, the New Zealand Post and Telegraph Department, the regulatory body in New Zealand, decided this message service was contrary to the radio regulations governing the amateur service here (no third-party traffic allowed), so NZART discontinued the Guard System.

About the same time as the Guard System was being formulated, a Christchurch group of amateurs under Norm Laugeson ZL3AS assisted by Hugh Simpson ZL3CF, Jack Elliott ZL3CC, and Les Hurrell ZL3BG had set up a group in that area able to go into action in an emergency at short notice should the necessity arise. But because the Christchurch group was part of the Radio Society of Christchurch and the Third District Transmitters Association, the two clubs catering to the local budding radio enthusiasts of the 30s, they were not part of the NZART message-handling system, although most of the group were members of the NZART. The Third District RTA in due course merged with the NZART to form the Christchurch Branch.

With the termination of the Guard System, Norm Laugeson, then a Vice-President of NZART, put forward a proposal to HQ for an emergency radio communications scheme, and in February, 1932, the proposal was adopted by the Executive of NZART, and amateur stations were asked to form themselves into local Sections of the Radio Emergency Corps, each self-contained but affiliated to the national body of emergency stations at Headquarters. Thus, the Radio Emergency Corps was formed.

The response from amateurs throughout the country was tremendous. A constitution was produced, and by March, 1932, nine Sections had been formed and a National REC Field Day was held to test the emergency network; 27 amateur stations and approximately 50 operators participated in that first successful Field Day.

The Field Day organization consisted of at least three stations, a Guard Relay Station (Base Station today), a Zone Station (Field Headquarters today), and an Outpost Station (or stations)—the same title today. Stations were to organize and ex-

change messages during the exercise, up and down the network. The Guard Relay Stations handled the messages between each District and distributed the messages for their own District to the Zone Stations, which retransmitted them to the Outpost Stations. Zone and Outpost Stations were operated at a portable location, on battery power.

The pace of the organization of the Radio Emergency Corps continued to quicken, and in June, 1932, negotiations were completed with the New Zealand Post and Telegraph Department for the allocation of special callsigns and wavelengths for the Emergency Service to use during practices and emergencies. As this step had finally cemented the setting up of the REC of NZART, Headquarters, through an editorial in *Break-In*, paid tribute to the untiring efforts of Norn Laugeson ZL3AS and Wally Ashbridge ZL2GP of Wellington, in formulating and founding the REC. Headquarters expressed the gratitude of all ZL amateur operators and the community at large for all the work these two men, and others closely associated with them, had done to set up an organization that was to become well known in the future.

Wally Ashbridge, a professional communications man in the New Zealand Army and the officer in charge of the Guard System, was appointed the first Commanding Officer of the REC. The collaboration between Wally Ashbridge and Norm Laugeson, professionally a detective in the NZ Police, is obvious today when one observes that there is very little difference between the basic organization of the present day emergency network systems and that which they formulated over 50 years ago. Truly a great tribute to the organizational abilities of these two men and their assistants.

The honor of the first operation went to the Christchurch group which went into action in January, 1932, in response to a request from Wally Ashbridge to provide some radio communications for search parties at an alpine tragedy in the Southern Alps. They made ready a group of four Christchurch amateurs, complete with transmitters, receivers, and suitable rations for one week in the field, within one hour of the request being received. They were to set up a communications net between the search parties in the Alps and the Telegraph office at Bealy, the headquarters for the search, some 15 miles distant. Although the missing trampers' bodies were found before the team was able to set up the communications net, it ably demonstrated the way REC was going to work in emergencies.

In July, 1932, the new REC held another Field Day with the newly allotted callsigns and wavelengths. In all, 11 Sections operated with the "E" calls very similar to those we use today, but only two-letter ones for obvious reasons. The present three-letter callsigns were introduced in the early 50s. At this 1932 Field Day, the frequencies used were between 100 and 105 meters, and these were found to be useful but not successful in some areas. The Field Day was a great success, and Wally Ashbridge declared that all Sections were fit to operate on emergency duties any time the need should arise. All Sections agreed that the exercise had been a successful one, but some felt that a frequency change could improve the communications between some of the Basic Stations.

By February, 1933, a new constitution and organization plan was approved by Headquarters and duly circulated to all members. The 1933 format and organization is still basically the same as given in our modernized AREC Manual in use today.

Over the years, the AREC has participated in many searches and rescues, severe floodings on both North and South Islands, air crashes, earthquakes, land subsidances, and marine searches. The Amateur Radio Emergency Corps of today is still the same as our founders intended—to provide emergency communications during times of national calamity or tragedy, and to provide readily organized mobile transmitting and receiving stations, equipment, and operators to function at short notice should they be required—except that the equipment we use today has changed drastically from that used in former times.

Today, when Search and Rescue Headquarters requires it, we are able to put teams into operation with portable and base stations to assist with all manner of emergency and rescue operations, whether it be in the city, the bush, mountainous terrain, or at sea.

In contrast with the 1932 Field Day statistics mentioned previously, and 51 years later, the 1983 Field Day statistics were: 59 Sections operated 266 Field Day stations, manned by 491 operators, on 80, 40, and 2 meters, and sent and received over 12,000 messages during the 6-hour period of the exercise.

AWARDS

Last month I made mention of a special award to commemorate the 100th birthday of Hastings City. Here are details.

The City of Hastings Centennial Award is open to all amateurs worldwide on all bands and all modes, the period of the award will be from 0001 hours GMT, February 1, 1984, until 2400 hours GMT, February 29, 1984 (*one month only*). Applicants for the award must complete two-way contacts with Hastings stations or members of the Hastings Branch number 13 of NZART as follows: overseas stations—3 contacts, any band, any mode; ZL stations—5 contacts, any band, any mode.

No QSL cards are required; just send a detailed list of the contacts, verified by another amateur operator, to the Awards Manager, PO Box 609, Hastings, New Zealand, with US$2.00 or IRC equivalent, to receive the handsome colored certificate.

Hastings is a city of about 50,000 population situated in the province of Hawkes Bay on the east coast of New Zealand's North Island. The area is favored with a good climate and is surrounded by some of the most fertile land in the country. Hastings is the center of a great and expanding food- and meat-processing industry and one of the most prolific fruit- and grape-growing districts in New Zealand; it justly earns the name, "The Fruit Bowl of New Zealand."

Hastings was constituted a town district in 1833, and in 1886 achieved borough status. The earthquake of 1931, followed by raging fires, caused great loss of life and reduced the town to ruins. The manner in which the city was rebuilt is a tribute to the citizens of that day. In 1956, the borough was proclaimed a city. The motto on the City Arms signifies the harmony between city and countryside.

So to all certificate hunters and readers of *73*, best of luck with this special award. Remember, it is available only for contacts during the month of February, 1984.

By my calculations, this column should be appearing in the January issue of *73*, so I take this opportunity of wishing all readers belated Christmas greetings and the very best of luck for the coming year. For those of you in the northern hemisphere, you are in the depth of your winter season at this festive time while we, down under, are enjoying mid-summer temperatures and our summer holidays, as well as the festive season.

In New Zealand, most large manufacturing businesses curtail their operations at Christmas time, closing from about December 23rd until around January 15th, except for maintenance staff, so we here all have our summer holidays at that time. The schools close for their summer vacation about December 15th and do not resume until February 1st, the equivalent of the US/Canadian July/August school holiday closing.

I hope everyone had a Happy Christmas and a joyous New Year and that Father Christmas brought you something worthwhile for the shack this year!

PAPUA NEW GUINEA

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Papua New Guinea

Lae is the capital of the Morobe Province, one of the twenty provinces of Papua New Guinea. The Morobe Province is located in the northeastern part of New Guinea. Lae, the administrative center of the province and also the industrial metropolis of the entire country, is situated on the Huon Gulf. It is the gateway to the Markham Valley. The population of Lae is approximately 65,000. In Lae we have the country's foremost technological institution, the Papua New Guinea University of Technology, commonly known as Unitech.

The amateur population of Lae is seven, four of whom are on the staff of Unitech (three in the Electrical Engineering Department). P29BR, P29LC, P29MC, and P29NL are Unitech staff. Husband and wife team P29JH and P29NWJ, John and Betty, are with the P and T Training College and are active from Lae. George P29NCB makes up the seventh member of Lae's amateur population; all are expatriates.

Unitech attracts students from all provinces of Papua New Guinea—indeed, from a number of South Pacific countries. What better forum for promoting and advertising amateur radio and thus increasing the number of PNG nationals who are amateurs? In November, 1982, P29BR, P29LC, P29MC, and P29NL put their heads together and decided to offer radio amateur classes to interested students. To publicize amateur radio, a lunch-time demonstration was organized with P29BR bringing his rig along and demonstrating it. The exercise also was written up in the campus newspaper, the *Reporter*. The response was tremendous, and more than 100 students enrolled for amateur radio classes. Thus the Unitech Amateur Radio Club (UARC) was formed and it has the callsign P29HT. The club is affiliated with the Papua New Guinea Amateur Radio Society.

P29BR, P29LC, P29MC, and P29NL give freely of their spare time and provide three hours of tuition per week in CW, theory, and regulations. Practical projects, such as building Morse-code oscillators, are included. P29BR records CW tapes for the weekly classes and on one occasion he decided to take the prepared tapes home. The following morning Bill discovered that his house had been burgled during the night but that the only things missing were the plastic bag containing the tapes, a pair of jeans, and a packet of cheese. A very selective thief, and one who will be bewildered by the strange sounds on the tapes!

The turnover of young hopefuls in the amateur radio classes is large; not many have the staying power, but generally 20 students attend and it is hoped that a number of those will attempt the Novice examinations the next time they are given.

Last year, Bill P29BR went on a visit to the United States and while there approached the ARRL regarding the possibility of donations of equipment and/or publications to help the students at the Unitech Amateur Radio Club; the oral response was positive. Bill also visited the Asia Foundation, and the Area Director for the Pacific Islands there offered assistance with postage expenses for sending material. An official reply was subsequently received from the ARRL which expresses unwillingness to deal directly with the Unitech Amateur Radio Club and appeared willing to have donations handled only through the Papua New Guinea Amateur Radio Society. There can be no questioning the ability of the staff and their supervision at the Unitech Amateur Radio Club. There also cannot be any doubt that future PNG amateurs are more likely to come from Unitech than anywhere else in the country. Why then this reluctance on the part of the ARRL to deal with UARC directly?

It is hoped that several of the students will be successful in the next Novice exams and that a number of PNG nationals will be on the air after that. Another consideration is the application fee which has to be paid six weeks prior to the exam. In the event of any students finding the fee beyond their means, the UARC is willing to come to the rescue out of club funds. We wish the UARC every success in their undertaking!

On July 14, 1983, the Post and Telecommunication Corporation in PNG sent out letters to all amateur radio station licensees introducing the new frequencies available as from that date. Full-call operators have the authorization to operate on all the new frequency bands. Limited amateur radio stations are permitted to operate on all new frequency bands above 30 MHz, and for Novice amateur radio stations there is no change in operating frequencies.

POLAND

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POLISH ETHER CARRIES SOUND AGAIN

On January 1, 1983, martial law in Poland was suspended. Polish hams expected to begin their usual activity. But no gain without pain. Renewing licenses was faced with official difficulties, and the commencement of reissuing them did not take place in January as it had been announced.

At the beginning of 1983, letters of application—printed forms submitted by petitioners to District Verification Boards—were still being brought up to date. At the end of January, 1250 applications were confirmed, and on April 1 over 1700. The Presidium of PRAA (Polish Radio Amateurs Association) was informed that

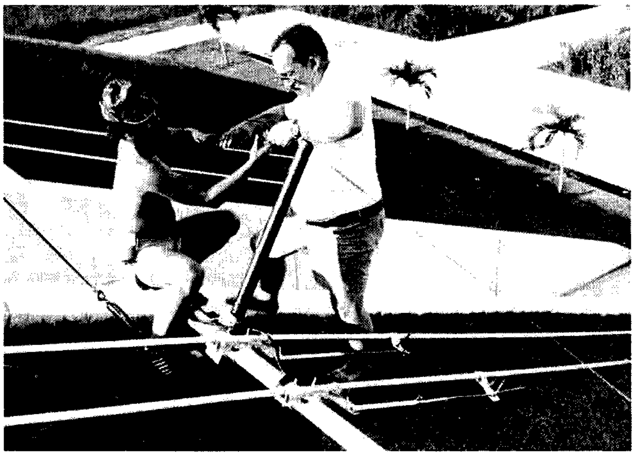
licenses of club radio stations would be handed over to them in April and those of individual radio stations at the turn of the second and third quarters of this year. Better late than never.

Negotiations with authorities brought changes of these provisions. For the sake of the annual international competition, the SP DX Contest, it was promised that licenses would be delivered in March, 1983. And really, 460 individual and 70 club licenses were given. Well, it's a long lane that has no turning. Poles are in the ether again.

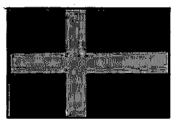
A problem is how well this process will continue. At the sixth PRAA director's meeting last April, the president of the association urged patience and calm but encouraged hams to continue to press for more action, through regular channels. He predicted that radio amateur activity would reach a normal level in a few months.

The president has also expressed regret at the new limitations placed on Polish hams and for the State Radio Surveillance.

It was hoped that by the end of 1983, the action of bringing licenses up to date would have been completed. How many Polish hams will be able to use their calls in 1984 when the National Congress of PRAA takes place, nobody knows. But some of them are presently in the ether, so enter upon a conversation with them!



Jean HS1ANV/ON8JA (left) and Hans HS1BG secure the supporting truss on the 20/15-meter (full-size) beam. Note the gamma match, using aluminum piping, plastic hose, and an inner core of copper tubing for the driven elements.



SWEDEN

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SVALBARD EXPEDITION

A Swedish group of four made a second expedition in the summer of 1983 to the Svalbard Islands in the Arctic Ocean. The group members do this entirely of personal interest on their own vacation time. Two members of the group were ham operators, Kjell SM2AZH and Sigvard SM2EJE.

The purpose of this expedition was to study the flora and fossils. Svalbard has an interesting history and has a geological structure of scientific importance. From the ham-radio point of view, the first trip in 1982 was no success. The radio equipment got damaged by water during transportation between islands in high winds.

The islands of Svalbard (prefix JW) belong to Norway. They are about 1,100 kilometers (700 miles) from the North Pole. The summer temperature reaches refrigerator level. The islands have no permanent residents, but boats stop there when the harbors are free of ice. Svalbard has been the base for many Arctic expeditions. The Norwegians began mining coal there in the 1890s.

Kjell and Sigvard were active from Svalbard using their home calls /JW between July 20 and August 4, 1983. In case you were lucky enough to work them, use their *Callbook* addresses for the QSL.

The equipment for the expedition was sent in advance on a ship for coal transportation. The group itself flew out of Tromsoe (Norway) to their base in Longyearbyen on Svalbard. The radio equipment consisted of a Kenwood TS-120V, the low-power version of this well-known transceiver, and a Heathkit HW-8 for backup. For power, they used two batteries rated at 60 Ah which they charged by a gasoline generator. The antennas for 7 and 14 MHz were verticals, and a dipole was used for 3.5 MHz.

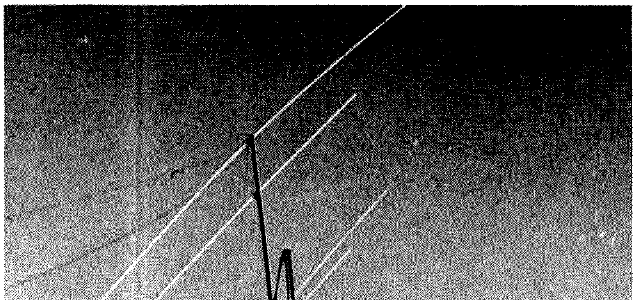
The propagation that far north is very poor on the low bands during the summer season. This is due to two months of daylight and sunshine 24 hours a day. They managed to contact northern Norway and northern Sweden on 40 meters, however, although 20 meters was the best band. A few good openings towards the US and South America stirred up some pileups. Anyway, hamming was not the main purpose for this expedition, so the QSO rate was low. Because of the frequent change of location and transport between islands in a rubber boat, operating time was limited. But wherever hams go and for whatever reason, they surely bring ham radio with them. Kjell and Sigvard and the two other members of this expedition must have had a unique vacation to remember!

NRAU MEETING IN STOCKHOLM

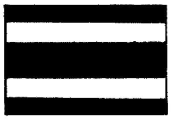
The Nordic Radio Amateur Union was formed in 1935 with the purpose of working for common Nordic interests for the radio amateurs. Through the NRAU there is a valuable dialogue between the leagues in the Nordic countries. Meetings are held annually. The next one is taking place in Stockholm on January 14-15, 1984. The NRAU runs a very low-budget operation, and to make it possible for representatives from distant Iceland (TF) and Faroe Islands (OY) to attend, the other larger leagues try to sponsor them.

Contributions from the Nordic Council, an organization founded in 1952 by the Nordic parliaments for improvement for Nordic cooperation, have been applied for. Unfortunately, no financial support has been received in previous years. Let us hope that they are more obliging this time.

One major subject for discussion at the NRAU meeting is the common Nordic license. This has been worked on for years, but still only regular reciprocal rules apply. Crossing borders between Nordic countries does not require a passport, and you have to be observant even to see the customs house, but still do not even bring the 2-meter hand-held over the border unless you have a valid guest license. Hopefully, this situation will be solved eventually so that it will be as easy to operate from different Nordic countries as it is between the USA and Canada.



The antenna is nearly ready for the HS0HS Seanet-contest operation.



THAILAND

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Most countries have their national radio society, and in Thailand the "magic" acronym is RAST, standing for the Radio Amateur Society of Thailand, which has been representing amateur radio activity in Thailand since its founding in November, 1963.

In addition to holding regular club meetings on the first Sunday of each month, to which all visiting radio amateurs are heartily welcomed, it has organized many other activities and has represented Thailand in the field of amateur radio on numerous occasions.

Highlights have been the Southeast Asia Network conventions in 1977 and again last year. Also, club representatives have endeavored to attend every major international conference on amateur radio, such as the World Administrative Radio Conference held in Geneva, IARU regional meetings such as the Manila conference in April, 1982, and the World Communications Year conference in Tokyo in September, and the World Amateur Radio International Conference.

Club meetings regularly vote on routine IARU motions, and full international representation is maintained through the club secretary. The address for all correspondence (as well as for the QSL bureau) is PO Box 2008, GPO, Bangkok 10501, Thailand.

A most encouraging aspect of amateur radio in Thailand has been the recent upsurge in interest among Thais in the hobby and its related aspects. Up until 1971, which coincided with the American presence in Vietnam, the society regulated membership to a maximum of 50. This was largely so that it could be in a posi-

tion to control the activities of what was at that time a hobby mostly pursued by American servicemen based temporarily in Thailand. But with the gradual withdrawal of American forces, the complexion of the club began to change. More Thais joined, and now the society has about 600 registered members, of which 90 percent are Thai—a far cry from the late 1960s when the hobby had caught the imagination of few Thais.

This upsurge can be attributed to several factors, not the least being enthusiasm shown by the Post and Telegraph Department and personally by the department's director-general, Police Major-General Suchart P. Sakhol, who addressed one very-well-attended RAST meeting in 1981.

It would also be appropriate to credit the society's former president, the late Brigadier-General Kamchai Chotikul HS1WR, for his lifelong dedication to the hobby. He also did much to popularize amateur radio and to increase club membership. All club members, as well as his many friends in amateur radio circles, were deeply saddened at his death in June, 1982.

The society has, of course, continued on its course of promoting the hobby and doing its best to popularize amateur radio and its self-educational aspect in this era of rapid technological advances, especially in the field of communications. As an example of this, the club has embarked on a course of teaching computer applications in amateur radio, since the integration of microcomputing and amateur radio is inevitable and they are compatible.

The society also has conducted other educational courses, including Morse code, and especially in teaching the electronic principles and operating procedures required for the Thai equivalent of a Technician's license for two-meter operation.

The Thai PTT has shown great enthusiasm for amateur radio, especially in the light of constraints relating to national security apparently imposed from outside the Communications Ministry. The department has also shown cooperation in authorizing special-event stations on the HF amateur bands for such occasions as major contests and for the Southeast Asia Network Convention in November, 1982.

RAST was thus able to operate an HF station for the Seanet contest in August this year as well as to take part in the All Asia DX Contest (CW section) that same month. Arrangements also were made for the CQ WW phone and CW contests in October and November.

In operating these contests, the club was most grateful to the Asian Institute of Technology on the outskirts of Bangkok which has endorsed our applications to operate on campus and which kindly offered the use of its premises for these club events. In this way, experienced amateur radio operators have been able to demonstrate several aspects of the hobby to those without firsthand experience.

For example, for both contests, club members constructed their own full-sized yagi beam antennas for the 10-, 15,- and 20-meter bands using entirely locally-available aluminum piping and other hardware. The antennas were up and in the air and getting 5 and 9 plus reports all within the space of two afternoons of work by a team of five hams: HS1AHT, who supervised the project, and HS1ALP, HS1BG, HS1ANV, and HS1AMH (yours truly).

The club also issues a much-coveted award, the Siam Award. This is granted to amateur radio stations and SWLs who have submitted evidence (endorsed log extracts) of contacts with Thai amateur radio stations in at least six of the nine call areas as well as the HSØ prefix which signifies a special-event operation. Alternatively, evidence of contacts with 10 different HS stations also qualifies for the award. Applicants should enclose US$5.00 or the equivalent in IRCs to cover the return postage of the award.

The situation regarding operating on HF on a routine basis has not changed since my September, 1983, column, but those who are looking for Zone 26 or Thailand on 10, 15, 20, 40, or 80 meters should listen for a pileup for the call HSØHS, the special-event station, during a major contest.

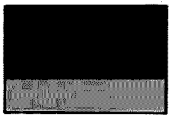
Qualified for license Class	Test for technical knowledge	Test for operating knowledge	Test on regulations	Morse Code send and receive (wpm)
B	75	65	65	12
A	65	65	65	6
C	50	65	65	N/A
Upgrade from A to B	75	–	–	12
Upgrade from C to A	65	–	–	6
Upgrade from C to B	75	–	–	12

Table 1. Percent-correct and wpm scores needed to qualify for licenses, by class and subjects.

Class	Number	PC of Total	PC Increase 1982-1983
B	26,944	56.1	5.1
C	20,254	42.2	1.6(!)
A	822	1.7	37.0
Total	48,020		4.0

Note: The A license has been in existence for only 2 years, and the major reason for the low increase in class C licenses has been due to license holders upgrading to higher license classes. Also note a bad sign: The *total* increase of 4 percent was down over the previous year's increase of 6.6 percent.

Table 2. Distribution of total number of licenses, by class, and percent increases.



WEST GERMANY

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With the hullabaloo concerning the FCC proposal for a code-free license, I felt that it would be appropriate to illustrate how such a license has been approached here in Germany. Before going into the code-free license specifically, let's get a general overview into the German licensing structure first.

There are only three license classes in Germany, A, B, and C. The B license is your all-purpose ticket, giving you full privileges on all bands with a maximum peak power of 750 Watts on 80 meters through 1.2 GHz, and with reduced power on 160 meters, the WARC bands, and the UHF bands 2.3 GHz and above.

The A license is similar to the present Technician-class license in the States, with full VHF/UHF privileges, and with CW from 3520-3600 and 21090-21150, plus full 10-meter phone privileges. Maximum peak power is 150 Watts for bands up to 1.2 GHz. This class of license can be recognized by callsigns beginning with DH.

The third class of license is the class C, the code-free license. This class of license carries all VHF/UHF privileges from 2 meters and up, with a maximum peak power of 75 Watts.

As for the exam itself, the biggest surprise is that there is actually only one exam for all three license classes! The difference between the three license classes lies in the score received on the exam, combined with the code speed tested. It is quite possible for an applicant for a class C license to pass the exam with a score qualifying him for a B license, with only the CW exam lacking. Judging by the number of technically-inclined individuals with class C licenses, I would assume that this situation occurs quite often.

Table 1 illustrates the four parts of the German amateur-radio examination along with the score (in percent) needed to qualify the applicant for a specific license class. Note that the class C license requires the applicant to score only 50 percent on the technical portion, which certainly makes this license class relatively easy to obtain.

Now come the big questions: What is the split between the three license classes and what is the impact of the class C license?

As of January 1, 1983, there were 48,020 licensed amateurs in the Federal Republic of Germany. The split and increase over January 1, 1982, is shown in Table 2.

Now for a bit of editorializing: I have to admit that I accepted the concept of a code-free license with trepidation. Having operated in the USA for nine years before moving to Germany six years ago, I could not bring myself to accept that the class C operators were anything more than a bunch of lids.

Having now had time to let it sink in, plus having been active in club activities, I have come to think otherwise. When I look around at my fellow club members, I see that a number of truly invaluable people are class C holders. There's the club newsletter editor, the member teaching a Basic course, others interested in building equipment for the club station, etc. Many of the other members are ex-C licensees, such as our club president and the one before him. In looking outside our little group, I also see class C licensees active in repeater groups, writing technical articles for amateur magazines, etc.

When you go up to one of the present or previous class C license holders and ask specifically if they would have bothered to have learned CW to get their licenses, the answer could be a "yes," or "no," or a "maybe," but in general they feel that it would have been an unnecessary hindrance. It really is too difficult to speculate on this point, but I'd hate to think about losing many invaluable fellow amateurs just due to the Morse code.

As for the lids on 2 meters with a California-size amateur population with very few repeaters to operate on, the incidence of turkeys is amazingly low when put into perspective. Remembering what it was like in California makes me appreciate the true professionalism many German class C holders exhibit.

Will it work in the States? In my opinion, only you can make it work. If you will accept a code-free licensee as one of your own and try to understand that he or she may be able to contribute to your club in some way, you will find that the Morse code does not really make one a better person. Quite the contrary, many of the young people now interested in computers or electronics would make great amateurs. Do you really want to have to force them all to learn the code? In Germany, we don't and it works!

DEALER DIRECTORY

Culver City CA

Jun's Electronics, 3919 Sepulveda Blvd., Culver City CA 90230, 390-8003. Trades 463-1886 San Diego, 827-5732 (Reno NV)

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EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	7A	7	7	3A	3A	3A	3A	3B	7A	14A	21A	21
ARGENTINA	14	7	7B	7B	7	7	14	21	21A	21A	21A	14A
AUSTRALIA	14A	14B	7B	7B	7B	7B	7B	14B	14	14A	21A	21A
CANAL ZONE	7A	7	7	7	7	7	7A	14A	21	21A	21A	14
ENGLAND	7	7	3A	3A	3A	7B	14	21	21A	14	7	7
HAWAII	14A	14	7	7	7	7	7	7B	14	21	21A	21A
INDIA	7	7B	7B	7B	7B	7B	14	14A	14B	14B	14B	7B
JAPAN	14A	7B	7B	7B	7	7	7	7B	7B	7B	7B	14
MEXICO	14	7	7	7	7	7	7A	14	21	21A	21A	21
PHILIPPINES	14	7B	7B	7B	7B	7B	7B	14B	14B	14B	14B	14
PUERTO RICO	14	7	7	7	7	7	14	21	21A	21A	21	14A
SOUTH AFRICA	14	7	7	7	7B	7A	14A	21	21A	21A	21	14
U. S. S. R.	7	7	3A	3A	3A	7B	7A	21	14	7B	7B	7
WEST COAST	14	14	7	7	7	7	7	14	21	21A	21A	21

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7	7	3A	3A	3A	3A	3A	7A	14A	21	21A
ARGENTINA	14	7	7B	7B	7	7	7A	14A	21	21A	21A	21
AUSTRALIA	21	14	7B	7B	7B	7B	7B	7B	14	14A	21A	21A
CANAL ZONE	14	7	7	7	7	7	7A	14A	21	21A	21A	21
ENGLAND	7	7	3A	3A	3A	3B	14B	14A	21A	14	7B	7B
HAWAII	21	14	7	7	7	7	7	7	14	21	21A	21A
INDIA	14	7B	7B	7B	7B	7B	7B	14B	14B	14B	14B	7B
JAPAN	14A	14B	7B	7B	7	7	7	7	7B	7B	14B	14A
MEXICO	14	7	7	7	7	7	7	14	21	21A	21A	21
PHILIPPINES	21	7B	7B	7B	7B	7B	7	7	14B	14B	14B	14
PUERTO RICO	14	7	7	7	7	7	7A	14A	21A	21A	21	14A
SOUTH AFRICA	14	7	7	7	7B	7B	7A	14	21	21A	21	14
U. S. S. R.	7B	7	3A	3A	3A	7B	7B	14	14	7B	7B	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7A	7	3A	3A	3A	3A	3A	7	7A	21	21A
ARGENTINA	21	14	7B	7B	7	7	7B	14	21	21A	21A	21A
AUSTRALIA	21A	14A	14	14	7B	7B	7B	7B	14	21	21A	21A
CANAL ZONE	14A	7	7	7	7	7	7	14	21	21A	21A	21A
ENGLAND	7B	7	3A	3A	3A	3B	7B	14B	21A	14	7B	7B
HAWAII	21A	14A	14	7	7	7	7	7	14	21	21A	21A
INDIA	14	14	7B	7B	7B	7B	7B	7B	14B	14B	14B	7B
JAPAN	21A	14	7B	7B	7	7	7	7	7	7B	14	21
MEXICO	14	14	7	7	7	7	7	7	14A	21A	21	21
PHILIPPINES	21A	14A	14B	7B	7B	7B	7	7	7	14B	14B	21
PUERTO RICO	14A	14	7	7	7	7	7	14	21	21A	21A	21
SOUTH AFRICA	14	7	7	7	7B	7B	7B	14	21	21A	21	14
U. S. S. R.	7B	7	3A	3A	3A	7B	7B	7B	14	7B	7B	7B
EAST COAST	14	14	7	7	7	7	7	14	21	21A	21A	21

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

JANUARY

SUN	MON	TUE	WED	THU	FRI	SAT
1 F/F	2 F/G	3 F/G	4 F/F	5 F/F	6 G/G	7 G/G
8 F/F	9 F/G	10 F/G	11 F/F	12 F/G	13 G/G	14 G/G
15 F/F	16 F/G	17 G/G	18 G/G	19 F/F*	20 P/F*	21 P/F
22 F/F	23 F/G	24 G/G	25 G/G	26 F/F*	27 P/F*	28 P/F
29 F/F	30 F/F	31 P/F				

International Edition

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Issue #281

Amateur Radio's Technical Journal

A Wayne Green Publication

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Hamfest Hints
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All About Op Amps
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Split Seconds—54

Next Month:
In Search of the Shuttle
Share the frustration, fatigue, and fun in the diaries of our special W5LFL correspondents. From Maine to Hawaii, they all gave Owen Garriott their best shots.

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INFO

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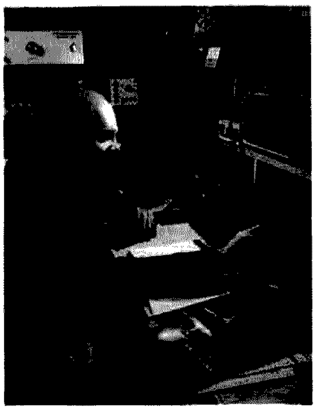
W2NSD/1
NEVER SAY DIE

editorial by Wayne Green



EGO

Yes, when you write to Wayne Green, I get your letters. Usually I answer, too, much to the surprise of a lot of hams. There is some sort of weird concept that because someone is rich and famous, he is no longer reachable.

Ha! There's that Wayne Green ego again—rich and famous, indeed! Well, golly, I *am* rich in some ways—and though I've worked a lot harder than most people to get this way, many begrudge it. I've been writing for how many years now telling you how to get rich? I wrote a booklet on the subject twenty years ago. And fame? Well, I'm well known in a couple of esoteric circles, if that qualifies. Wayne Green is not yet a household term.

Several letters of interest arrived in the last few days. One chap advised me that he was canceling his subscription because my ego is too big and three thanked me for egging them on to become entrepreneurs and making them rich. Well, I don't know what to do about my ego except ask you to live with it and enjoy it the way I do. Without my ego prodding me, I'm not sure where a lot of things would be.

It's a funny thing about "rich." Sure, I have millions to spend just about any way I want, so what am I doing with all of that loot? Well, for the most part, I am using it to help people with ideas bring them to fruit and to make some of my own ideas work. A plane? Nope, I tried that almost 30 years ago, back in '57, and got it out of my system. A big house, right? Tried that in '69 and didn't like it. No, I have a small room over my office which is all I need for the few hours I waste sleeping each day. I've been putting in hundred-hour weeks for years and enjoying it.

A few weeks ago, I attended an evening class in the art of conversation here in Peterborough. Each of us was asked to explain why we'd come to the class. My rationalization was that I really didn't know how to cope with cocktail parties. What in the hell can one possibly talk about when meeting someone for the first time in a noisy room where the meeting will be for only a few minutes? As I explained, I realized that I had exactly outlined one of the big problems with amateur radio—we meet new people under noisy conditions and are expected to provide some entertainment.

I was assured by everyone else in the class that my prob-

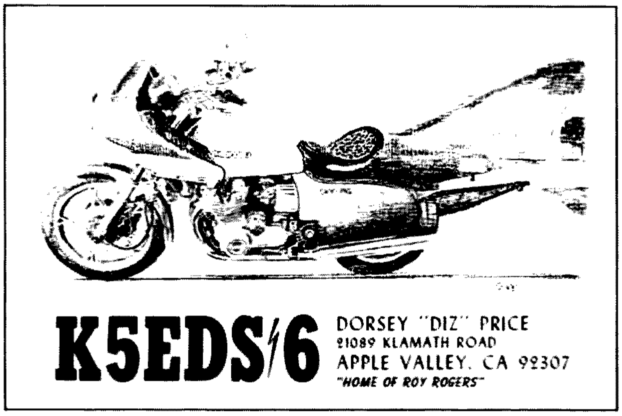
Continued on page 100

HELP WANTED

73 is currently seeking a TECHNICAL/INTERNATIONAL EDITOR. The position requires excellent written and oral communications skills, as well as a General-class or higher ticket. Experience with microcomputers would be a help. Responsibilities include participating in manuscript review, organizing and implementing special projects, and supervising our staff of foreign correspondents.

We offer a competitive salary and benefits package and excellent, informal working conditions. As you may know, Peterborough is located 75 miles from Boston in the beautiful Monadnock region of New Hampshire—a state with no sales or income tax.

Of course, we are an equal opportunity employer. If you are a non-smoker interested in this position, please forward your resume and salary requirements to: Jack Burnett, Executive Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.



QSL OF THE MONTH

We don't know what a "Sky-Pig" is, either, but it sure makes you take a look at Diz Price's card.

To enter your QSL, put it in an envelope along with your choice of a book from *73*'s Radio Bookshop and mail it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not in envelopes or without a book choice will not be accepted.

J. W. Spencer W4HDX
300 Lido Cove
Niceville FL 32578

This Antenna Is Too Good To Be True

It's cheap. It works well on all bands. And it radiates a super signal.

Completed antenna mounted in tree.

Would you like to have an antenna that is capable of working all the HF bands, or any combination of the HF bands including the new WARC bands, with excellent results, at a fraction of the cost of any of the commercially-available multi-band antennas now on the market? Would you also like to have an antenna with an extremely low noise factor? I'm about to describe an antenna that is just what you've been looking for.

This antenna is a combination of the old reliable Zepp with the addition of a balanced, shielded feeder system which has been described in various articles in past years.

This antenna has been in use at this QTH as well as other locations for over two years and has yielded many fine DX contacts and many good reports stateside.

To determine the comparable merit of this antenna, I erected separate dipoles cut for the center of each band and fed with a single coaxial cable. Then I connected all antennas so they could be switched rapidly to determine the comparable signal strength of each as compared to the Zepp antenna.

In addition to the favorable signal strength comparisons, I also found that the noise level on the Zepp antenna was as much as 5 S-units lower than the noise on the cut-to-frequency dipole with single coax feed. I noticed this particularly on

Desired Bands of Operation	Length of Each Side of Antenna From Center to Each End
160–10 meters	108 feet
80–10 meters	54 feet
40–10 meters	27 feet
30–10 meters	18.7 feet
20–10 meters	13.5 feet
17–10 meters	10.4 feet
15–10 meters	9 feet
12–10 meters	7.8 feet

Table 1.

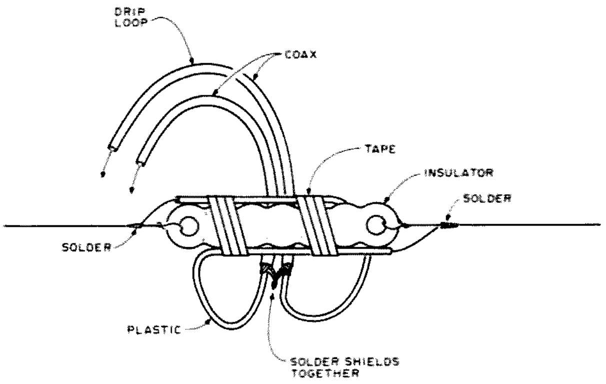


Fig 1. Method of supporting coax cables.

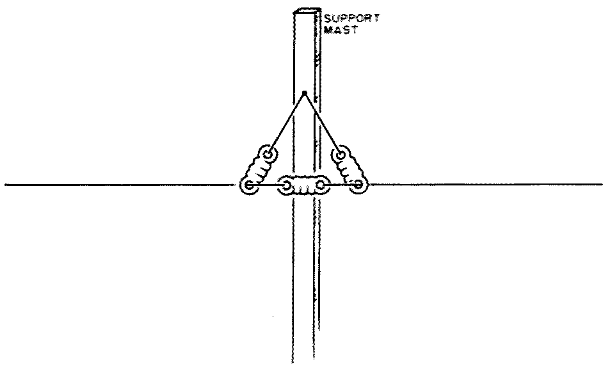


Fig. 2. Method of supporting antenna at center.

the model of this antenna which was erected inside the attic of the house in close proximity to the ac wiring of the building, where the noise level dropped from an S-7 on the regular dipole to an S-2 on the Zepp antenna.

To erect this antenna, you simply figure the length of each side of the flat-top from the center to one end by using the figures shown in Table 1.

This antenna can be cut for operation an any combination of the HF ham bands, including the WARC bands which have not yet been released. For example, if your space is limited, you could put an antenna in the attic of the house, as I did at one location where I had an attic length of only about 30 feet, by figuring the antenna for operation on the bands from 30 through 10 meters, resulting in a length each side of center of 18.67 feet. Then I ran the wire in a Z configuration through the attic to compress it into the available space.

I have used various configurations on this antenna, such as the halo and the inverted vee, and all give good results. If you can get the wire running in a fairly straight line, though, your radiation pattern will be more predictable.

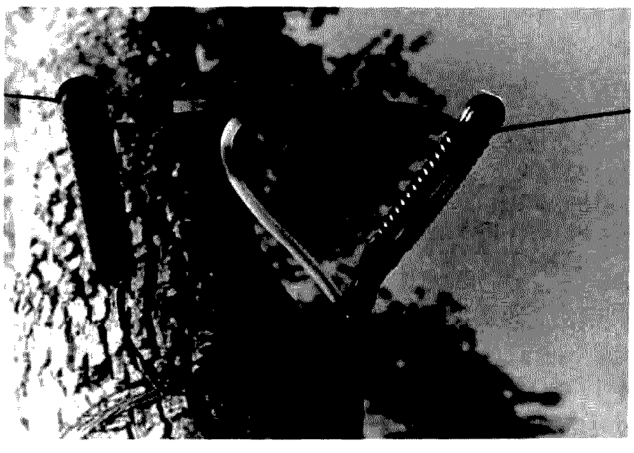
The flat-top portion is designed so that it is non-resonant on all bands of operation, thereby avoiding any extremely high or extremely low impedance points at the feedpoint. It is designed to be resonant between the one-quarter, half, three-quarter, and full-wave points on each band, thereby presenting an impedance to the antenna tuner which is well within range of the tuner on each band and will not cause any loading problems. An antenna tuner is required which has a built-in balun or you must use a 4-to-1 balun at the bottom end of the line if you don't have one built in the tuner itself.

The feedline is made of two runs of RG-8/U cable for powers up to 2 kW PEP, or for low-power operation under 100 Watts output, RG-58/U cable may be used. The lower loss of the larger cable is to be desired, however, even if low power is used.

At the top end of the feedline, you connect the shields of the two coax cables together but *do not* connect them to anything else. Then at the bottom end of the line, the shields are tied together and connected to the ground connection in the shack and to the frame of the tuner.

The inner conductors of the coax cables are tied to each leg of the antenna wire at the top of the line, and at the bottom end of the line they are connected to each of the balanced-output terminals of the antenna tuner.

The feedline can be run anywhere—underground, through metal or vinyl conduit, or in the open. The advantage of this arrangement, however, is that unlike the old open-wire feedline previously used on Zepp antennas, it does not have to be kept clear of surrounding objects and is not affected by anything it lies against.



Center support and coaxial connections.

There is only one precaution that must be observed, and that is to cut both runs of the cable exactly the same length. They do not have to be run together, however, as the shield on the cables provides exact electrical separation of the inner conductors even if the two cables are widely separated.

As to the length of the feedline, I found that best results were observed with line lengths of a little more than one-quarter wavelength at the lowest frequency of operation (or anything longer than that). Try to avoid making the feedline resonant at any particular frequency you are operating on, particularly the quarter-wave points, or you may have a bit of trouble tuning on this band. Optimum length seemed to be about 55 feet for 80-through-10-meter operation.

As for the mechanical construction, it is a good idea to use a long insulator, the same type used on the ends of the antenna, at the center of the antenna. Then slip the end of another insulator of the same type over the wire on either side of the center insulator, coming off at right angles to the wire and tying the support wire to these two side insulators so that equal pull is achieved on either side of the center insulator. Then

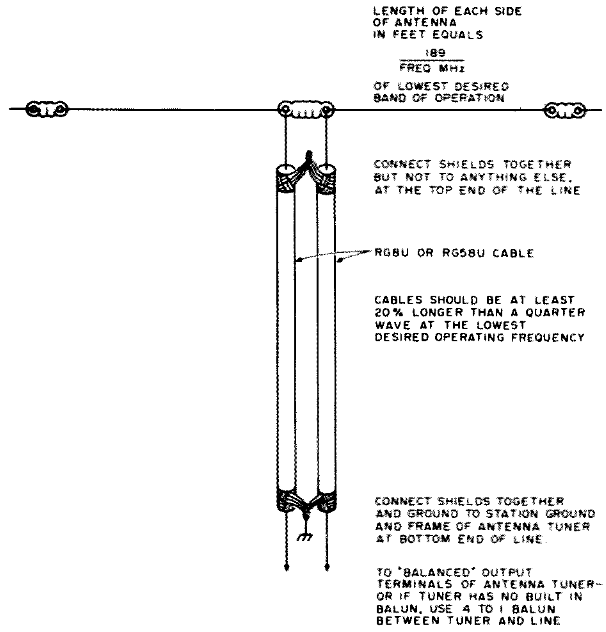


Fig. 3. Allband trapless antenna for HF.

at the point where you need to support the two coax cables, just strip off about 2 feet of the braid, leaving the plastic inner insulation, and bend this part along the center insulator on each side and tape securely to the insulator. This will make a very solid support for the coax cables and will prevent wind damage.

It is also a good idea to bring the coax up the support mast a little higher than the antenna wire and bend it over in a loop and down about a foot or so to prevent the water from leaking into and running down the inside of the shield on the cables.

To separate the braid from the inner conductor on the coax, strip the outside plastic covering off about two feet from the end, then take the end of the shield and push it down, compressing it so that it becomes larger in diameter. Then take an awl or the tip of a small screwdriver and carefully spread the strands of the braid apart, opening up a hole in one side of the braid. At this point, bend the coax in a U shape and pull the plastic insulated center conductor out through the hole in the side of the braid, U-end first. This will eliminate the need for making a solder connection directly next to the plastic where it might create a weak spot.

I have used this antenna in various situations cut for all different combinations of bands and have had excellent results with all of them. I have also made up a portable version of this antenna using stranded insulated wire such as zip-cord and RG-58/U cables which I use in conjunction with a small antenna tuner for operation on 20 through 10 meters. This one is only 13.5 feet long either side of center with two runs of coax 20 feet long. It is ideal for stringing up in a motel room or apartment by supporting it with nylon fishing line. Just keep the antenna out a foot or so from the wall and support it by anything you can find to tie it to. Try it. You'll like it! ■

Construct the Minuteman Timer

As faithful as a grandfather clock, this timer tells when to ID—and when not to.

Gary L. Fait KA8QBQ
302 E. Lexington St.
Davison MI 48423

"But why do you need another ID timer?" my wife asked when she saw me trying to sneak yet another Radio Shack bag to the workbench.

The question was no surprise because my very first electronics project had been an ID timer described in one of the ham magazines. It had worked perfectly, and I remembered well how I had shown it to her and carefully explained why I had added a single LED to the circuit for a visual signal.

The answer to her question, however, was that this timer is even better but it is still simple. Using a seven-segment LED, the timer steps off the minutes beginning with zero.

Many ID timers provide only an audio and/or visual signal when eight or nine minutes have passed. Using this type of timer, the radio operator never knows how much time has elapsed until the signal sounds. I found myself identifying too often because I was never sure when the 10-minute mark would come.

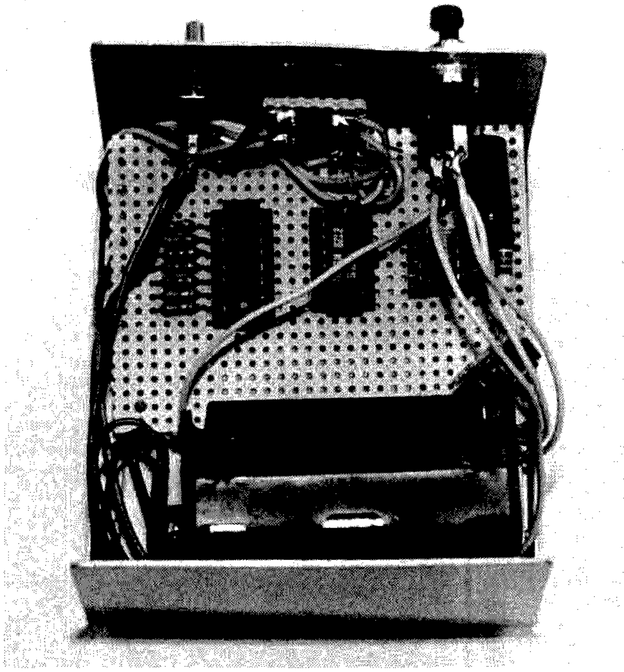


Photo A. Interior view of the timer.

Photo B. Front panel and cabinet for the ID timer.

To solve the problem, I began with a basic timing circuit using three ICs plus the seven-segment LED. I added two push-button switches, one to restart the timer after identifying and one to reset the numeral on the LED.

The 555 timer is controlled by R1, a 1-meg pot. The circuit can be set to time anything from seconds to hours. In this case, obviously, it is adjusted to provide one timing pulse per minute.

Opening S2, a normally-closed momentary-contact switch, causes the resetting pins on the 7490 to go high. This resets the LED to the numeral nine. S3, a normally-open momentary-contact switch, is then closed. This shorts R1, causing the 555 to pulse, beginning a new timing period and by the way causing the LED to pulse to zero.

After turning on the timer, operation is as simple as one-two. Simply push S2, then S3, to begin at zero. If you identify before the 10 minutes have completely elasped, simply give it the one-two again and the timer is back to zero and counting a full minute.

All parts for the LED ID timer are readily available from Radio Shack. Many parts are probably in any well-stocked junk box, but even if purchased new, the timer will cost less than $10. It can be housed in any suitable enclosure. I used a small, steel-topped cabinet because I wanted to impress my wife, but the extra expense of the cabinet is not necessary.

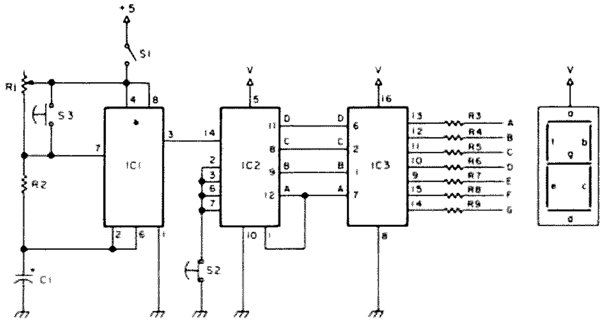


Fig. 1. The LED ID timer schematic.

Parts List

C1	100 uF
IC1	555 timer
IC2	7490
IC3	7447
R1	1 megohm pot
R2	1k
R3-R9	330 Ohm
S1	SPST toggle
S2	normally-closed momentary
S3	normally-open momentary
LED	7-segment common anode

The circuit is extremely simple and is an ideal project for the beginner, but one note of caution is in order. I suggest the use of IC sockets for mounting the three ICs and the LED, instead of soldering them directly to the circuit board. The entire project can be assembled before the ICs are installed, reducing the risk of damaging them in the process. The sockets also allow easy replacement for troubleshooting.

My LED ID timer now sits beside my rig, faithfully ticking off the minutes and saving a lot of unnecessary callsign transmissions. Now, if I could just get my wife to stop borrowing the thing to time her daily exercises. . . ■

✓ See List of Advertisers on page 98

Peter S. Carr WB3BQO
329 Little Avenue
Ridgway PA 15853

The Secret of Remote Control

Inside those miniature planes lie some sophisticated circuits.

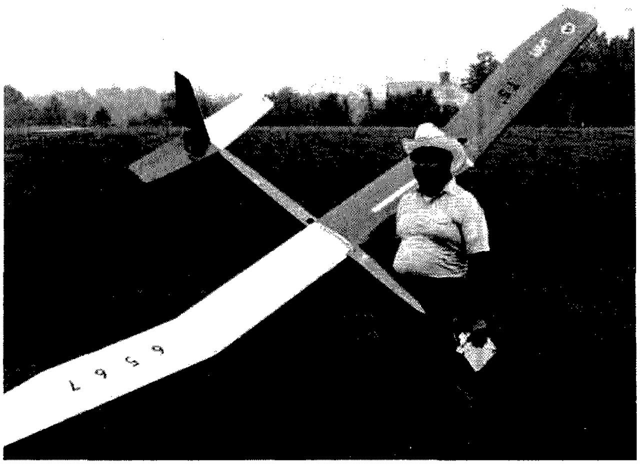
The Field House falls quiet as the pilot winds up the rubber-band motor of his scale model of the Porterfield Collegiate. The plane, which is made of lightweight balsa and covered with tissue paper, is held against the pull of the motor by a helper. Then, with the controls checked, the pilot gently tosses the plane toward the far end of the basketball court and steers the plane as it climbs. The pilot guides the Porterfield around the ceiling lights and basketball backboards until the motor winds down and the plane lands on the floor.

The pilot, a member of the State College, Pennsylvania, Radio Control Club, is an amateur who reworked his Heathkit® radio to reduce its size and weight to fit inside the small Porterfield. By removing the receiver case and using hearing-aid batteries and special small servos, he was able to make a flying machine small enough to fly well inside the confines of an indoor basketball court.

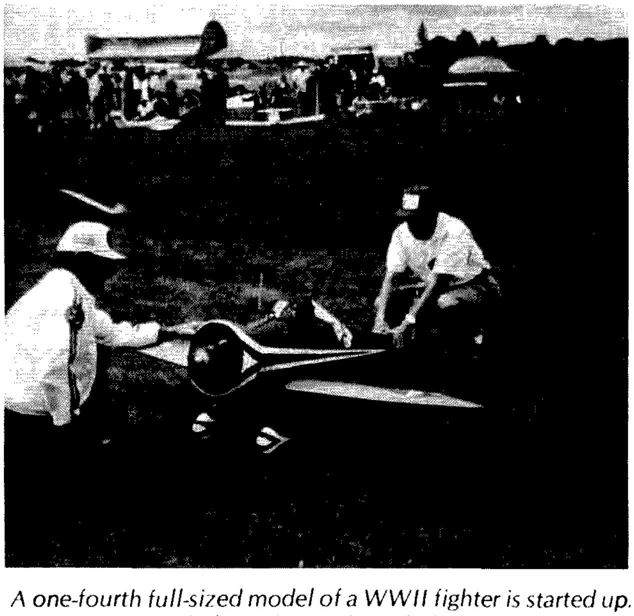
At the other end of the spectrum is the PennFli, an original design of a radio control (R/C) pilot from Indiana, Pennsylvania. The aircraft has a fourteen-foot wingspan and weighs over five pounds. In the warm air of summer, this plane can climb to heights of more than a quarter mile and fly over an hour without landing. It uses warm air up-drafts to stay aloft without a motor and its flight time is limited by the size of the batteries on board.

The Porterfield and the PennFli, for all their differences in size and weight, share a common guidance-system principle. It's called serial digital data transmission and it links the pilot's hands to the steering controls of the aircraft he's flying.

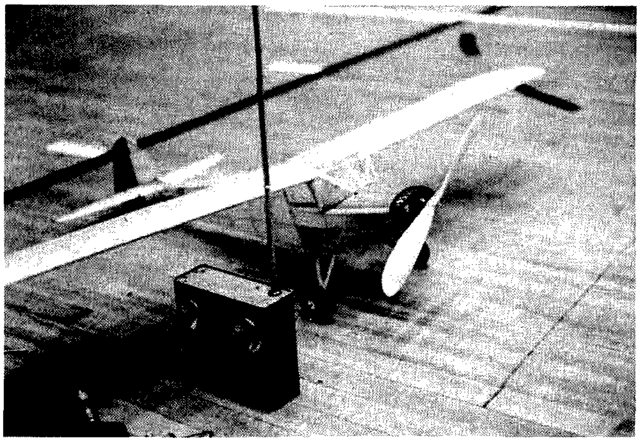
In Fig. 1, the scope trace shows that a timing or clock pulse initializes the sequence by turning on the decoder chain in the aircraft receiver. The next pulse in the series is a data pulse of between one and two milliseconds duration, the width of which is controlled by a joystick on the transmitter. The length of the pulse determines what position the servo arm will take. A pushrod connected between the arm and a control surface, in this case the rudder, links the servo to its workload. The receiver detects the transmitter's signal, decodes the serial data, and routes the proper pulse to each servo. In the servo, the pulse is compared to another from the onboard circuits, a function of where the servo arm is positioned. The error dif-



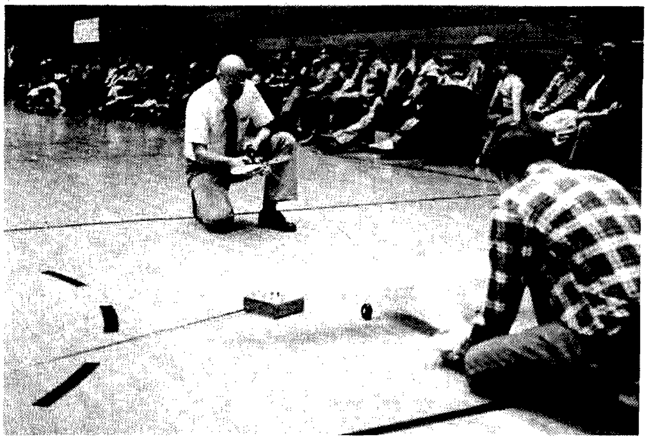
The PennFli, an unlimited class sailplane of fourteen-foot wingspan, weighs about five pounds. Made of balsa and plywood, the plane is covered with a plastic film which shrinks and sticks to the wood when heated with a common clothes iron. Controls are rudder, elevator, spoiler (airbrakes), and releasable tow hook.



A one-fourth full-sized model of a WWII fighter is started up. Constructed of balsa, plywood, and thin aluminum and covered with fabric, the plane uses a chain-saw engine and two-cycle mix fuel for power. A four-channel R/C rig controls ailerons, rudder, elevator, and engine speed.



The tiny Porterfield at rest. The model is made from a $5.00 free-flight kit of thin balsa strips covered with lightweight tissue paper and lightly sprayed with model paint.



A one-inch-per-foot scale model of a Porterfield Collegiate is powered up. A small hand drill and hook are used to wind up the large rubber band to full power.

ference of the two pulses is translated into action through a small dc motor similar to those used as automatic film-winders in cameras. Through a gear train, the motor moves the output arm and also a variable resistor which sets the length of the onboard pulse. When the error ratio of the two pulses is zero, the servo output arm and control surface to which it is connected are in the position called for by the pilot and transmitter. The pulse rate is fast enough so that the net effect is smooth movement of the controls and realistic maneuvering of the plane.

Were all this taking place on the ground where conditions were constant, R/C control would be a fairly simple system. By installing half the control system in an aircraft which at launch is mere inches from the transmitter, then flying the plane so high and far that it looks like a dot in the sky, using simply a length of hookup wire for an antenna, a very special receiver is needed to maintain constant control. As the radio is amplitude-modulated, static or other electrical noise could blank or change the length of one or more data pulses causing steering problems and possibly a crash. A 500-milliwatt rf signal from the transmitter is hot enough to provide solid contact out to over a mile depending on the altitude of the aircraft. The receiver is usually triple-tuned at its antenna circuit for adjacent channel rejection while a double-stage agc circuit holds the signal from the single-conversion i-f strip constant no matter how much rf is picked up by the antenna.

All this is performed by a receiver board about the size of a pack of book matches. The decoder board is the same small size and is wired to take power and audio signal output from the receiver. The long clock pulse sets the time sequence for the decoder and helps it to disregard stray noise which does not occur in the proper or expected time frame. The clock also tells the decoder which of the following data pulses are to be routed to the individual servos. The clock does not leave the decoder board while all the following data pulses are fed to their respective servos.

Most systems today are powered by nickel-cadmium rechargeable batteries in both the transmitter and the airborne unit. Airborne battery voltage is normally 4.8 volts from four 500-mAh AA-size batteries wired in series. The transmitter uses 9.6 volts from eight batteries of the same size and rating as the airborne pack. For aircraft which are ¼-size scale models of full-size planes and have six or eight controls under R/C command, D-cell-size nicad batteries are needed to handle the high net current draw. The added weight of the big pack is also helpful in balancing the model for stable flight.

While most R/C systems are factory built, Heathkit and Ace R/C, Inc., both offer full lines of radios in kit form. As mentioned earlier, the small size and high parts density of the receiver and servos make the building

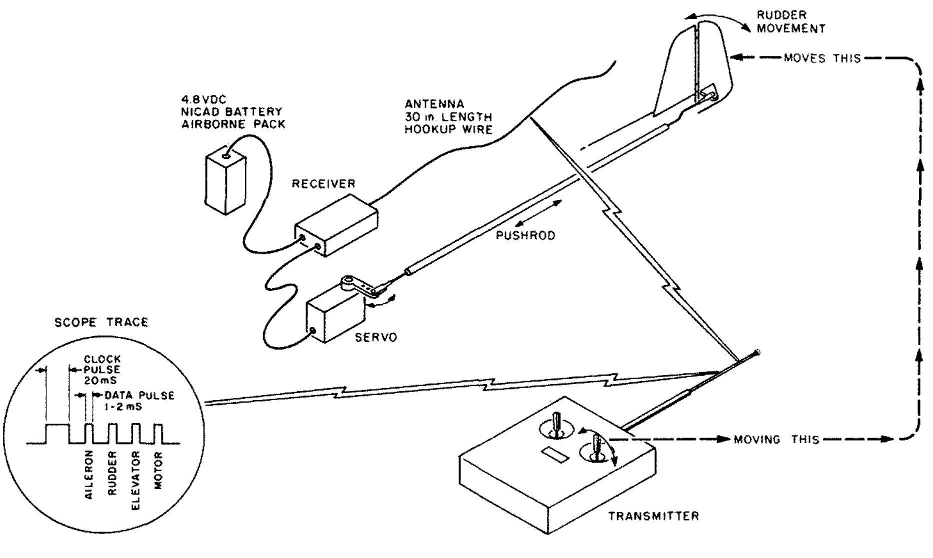


Fig. 1.

task somewhat more critical than wiring an HW-101. While it does call for some high-grade construction skills, most any amateur with some bench time will have no trouble assembling kits from either of these vendors. Both offer operating frequencies in the six-meter band where few interfering signals exist and where there is no crowding, as up in the 72-MHz CB band. While there is no mode restriction for R/C in the amateur bands, only Kraft Systems, Inc., offers an FM-type R/C rig; it is only available factory built. In high rf noise applications such as R/C model helicopters, an FM radio with its higher immunity to static would be a good choice. In most other types of models, the AM type of modulation is very reliable.

Equally as important as the system's electrical specifications is its ability to take physical punishment and be reliable. Whether the aircraft has a large or small engine, each will vibrate the R/C to some degree. If components on the receiver or servo circuit boards aren't mounted close to the board and well soldered, vibration will get them sooner or later. Even gliders, which have no engine, are battered in the landing zone as they have only thin rubber skids on the bottom of the fuselage. The quality of workmanship is very important in R/C rig construction, since almost any circuit failure would cause the plane to crash.

Once an R/C system is built, it can be modified to "fly" many different types of models. Miniature replicas of ocean-going sailboats can be raced in a pond or swimming pool using specially waterproofed gear. Even submarines which have the ability to submerge are available as R/C model kits. The hottest Formula and Indy-type race cars are built from kits and raced using two-channel radios and either electric motors or glow-type model engines. New military tank models have come out which will climb obstacles, go forward, reverse, go left and right, and swing the turret cannon. Helicopters fly in scale fashion in competition by carrying cargo or flying in formation or firing small solid-fuel rockets at targets.

By far the most popular are the scale models of World War II military aircraft. With the reliable radios available today, anyone can pilot the model of his favorite plane and enjoy the thrill of flying the old war birds.

Adapting the radio system to function in any of these models will allow the amateur to use the same rig in several models. In some cases, extra receivers and servos are built for installation in models and operated from a common transmitter so that two or more planes can be flown without having to field-change radios from one model to another.

Since there are few of us who can afford to own a Mustang fighter or a B-29 Superfort, a model of these planes is more practical. From biplanes to the space shuttle, R/C radios allow us to build and fly the most exotic flying machines safely and reliably. Imagination is the only limiting factor in choosing which model to operate, and amateur skills at the workbench make the radios as inexpensive as they are reliable. ■

Kit Manufacturers

Heath Company
Benton Harbor MI 49022

Ace R/C, Inc.
Box 511, 116 W. 19th St.
Higginsville MO 64037

Kraft Sytems, Inc.
Box 1268
Vista CA 92083

Calculate Your FT-101

Here's how to treat your trusty FT-101 to a truly automatic digital display and get a frequency counter in the same box—at the flick of a switch.

D. N. Ellis VK8DE
57 Memorial Avenue
Alice Springs, N.T. 5750
Australia

The FT-101 series of HF transceivers has been one of the most popular in amateur radio history. One lingering criticism of the models through the "E" series, however, was the lack of a true calculating digital display. While Yaesu did offer the YO-601 digital display, it counted only the vfo and required operator adjustment for correct frequency display with any band or mode changes.

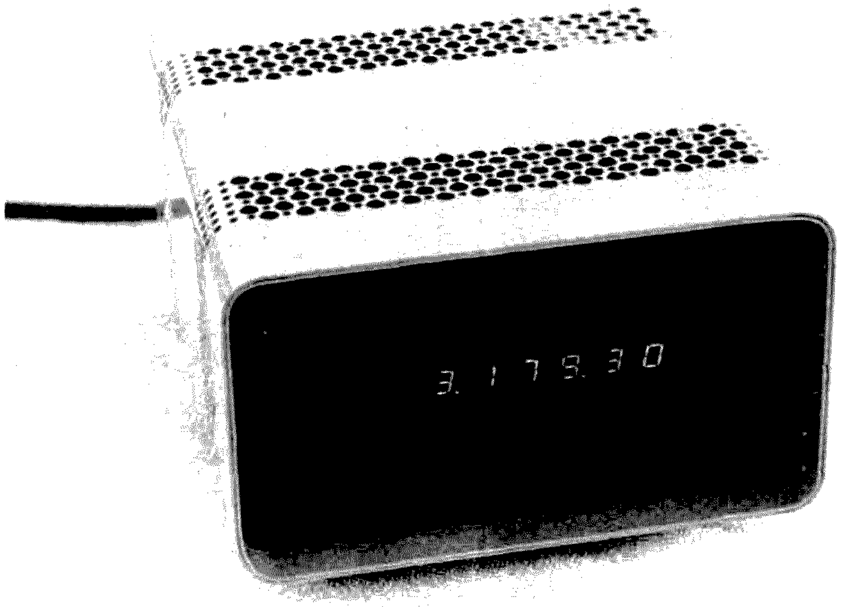


Photo A. Front view. Note that many ventilation holes were drilled oversize for more effective convection cooling of the internally-mounted LM323K voltage regulator and heat sink (photo by R. Campbell).

The "VK8DE Calculating FT-101 Display" is a "hands-off" calculating counter giving true zero-beat frequency readout on all modes and bands. It is inexpensive and straightforward to build and requires only a simple passive interface to the FT-101. It can also serve as a 50-MHz bench frequency counter, and also sports a switchable calibration output signal. The implementation used is LSTTL (Low-power Schottky), available worldwide at low cost. An accurate, automatic digital display is a necessity on the crowded bands, and this project is a convenient and economical upgrade for FT-101 owners.

The counter performs the following frequency calculation formula according to the FT-101 oscillator mixing scheme: F = bfo + LO − vfo, where F = the displayed frequency, bfo = mode-switched Beat Frequency Oscillator (LSB, USB, and

CW/AM), LO = bandswitched Local Oscillator (1 crystal per band), and vfo = dial-tuned Variable Frequency Oscillator.

General Description

Reference to the block diagram of Fig. 1 will be helpful for a general description. The three oscillator signals are routed from the FT-101 external vfo octal socket (J13) on three previously unused pins through coax to the display box.

Isolation amplifiers buffer the signals and then perform a TTL level conversion for the digital processing. A crystal-referenced oscillator feeding a decade divider chain provides necessary timing for the control section. The control section directs up-down counters to follow the frequency determination formula and finally to store and display the information in 7-LED numerical displays. The FAST/SLOW switch offers the operator a choice between 80- or 800-ms-display updates with 100- and 10-Hz resolution, respectively.

The FT-101/external switch allows the unit to function as a normal frequency counter using the LO jack as the input source. The bfo-detect circuit is used to provide a preset substitute value in the absence of bfo signal, such as in AM receive mode. This feature also gives zero-beat CW frequency when the FT-101 mode switch is moved from CW to AM. The "normal" CW presentation is offset low by 800 Hz if tuned properly, which happens to be the difference between the FT-101's USB oscillator of 3.1785 MHz (used in CW receive) and the CW/AM oscillator of 3.1793 MHz (used in CW/AM transmit). A regulated +5-volt source supplies the necessary power for the counter, displays, and isolation amplifiers.

Circuit Details

References to the timing diagram (Fig. 2), and the four sections of the schematic (Figs. 3, 4, 5, and 6) will be made in this section. Fig. 3 shows the raw analog bfo, LO, and vfo cables routed to the BNC jacks J1, 2, and 3, respectively. With the exception of a single input resistor change in the bfo isolation amplifier, the three buffer-converters are identical. One description will, therefore, serve for the three circuits.

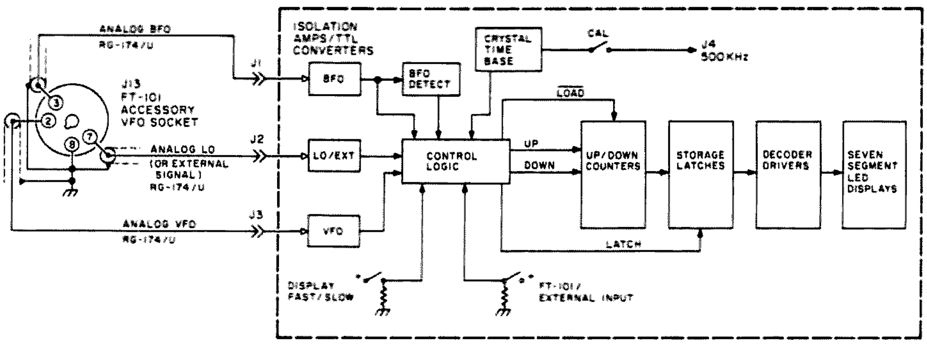


Fig. 1. Block diagram.

Because of the JFET input and the 1-megohm bias resistors, each of these amplifier's input impedance is essentially the value of the input resistor. For high sensitivity it is 1000 Ohms for the LO and vfo, and 10,000 Ohms for the bfo. These impedances do not appreciably load the oscillator signals with 1-meter connecting lengths of RG-174/U coax from the FT-101.

The JFET then feeds an NPN driver which emitter-couples via a large value capacitor to a linearly-biased 74LS04. The IC wired in this manner, as a dc-coupled multistaged amplifier, produces a TTL level (HIGH $\geqslant$ 2.7 V, LOW < .8 V) pulse output from the sinusoidal input. This cheap but utilitarian dc 50-MHz analog-to-TTL amplifier has been used so often by so many that it must nearly be "public domain."

Fig. 4 shows the bfo, LO, and vfo TTL signals as inputs to the timing and control section. In order to guarantee the successful use of low-cost LSTTL, the signals are each prescaled (divided) by a factor of 2. This forces the maximum LO input of 35.52 MHz (used in the 29.5–30-MHz band of the FT-101) to a value of 17.76 MHz after passing through U8, a 74S74 flip-flop.

The guaranteed specification of 30 MHz for a 74LS74 flip-flop, or for that matter, the 74LS192 up/down counters, is thereby never tested. The penalty for prescaling by two is a corresponding extension of the counting time by the same factor.

The control-section activity is directed by a four-state counter made up of U18, a 74LS74. Besides creating a specific counting interval for the bfo, LO, and vfo, the state counter provides a fourth interval to display the resultant frequency calculation and then prepare the machine for another cycle. The timing diagram of Fig. 2 shows the succession of these states and the ensuing events. The state names of 00, 10, 11, and 01 are derived from the successive logical conditions of U18 pins 5 and 9, called Q_A and Q_B. The 1-MHz crystal oscillator of U6 is divided down to provide a continuous stream of state clock pulses as shown in Fig. 2.

Three state clock pulses cause the machine to count up the bfo, count up the LO, and count down the vfo, or add, add, and subtract, in accordance with the F=bfo +LO−vfo equation. The fourth state, called 01, causes a LATCH command to store the frequency value

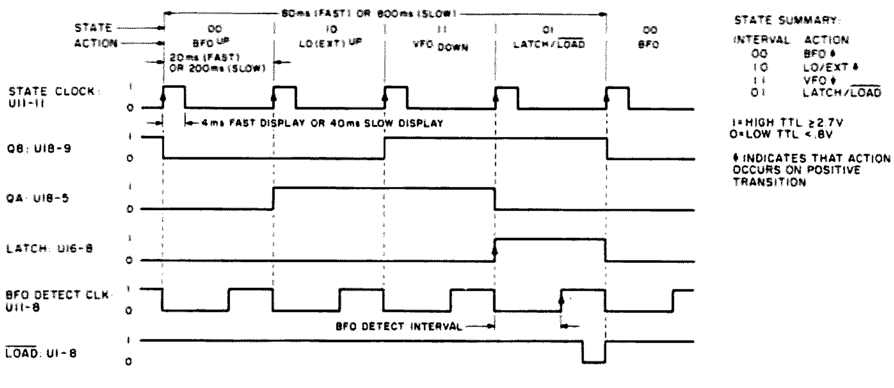


Fig. 2. Timing diagram.

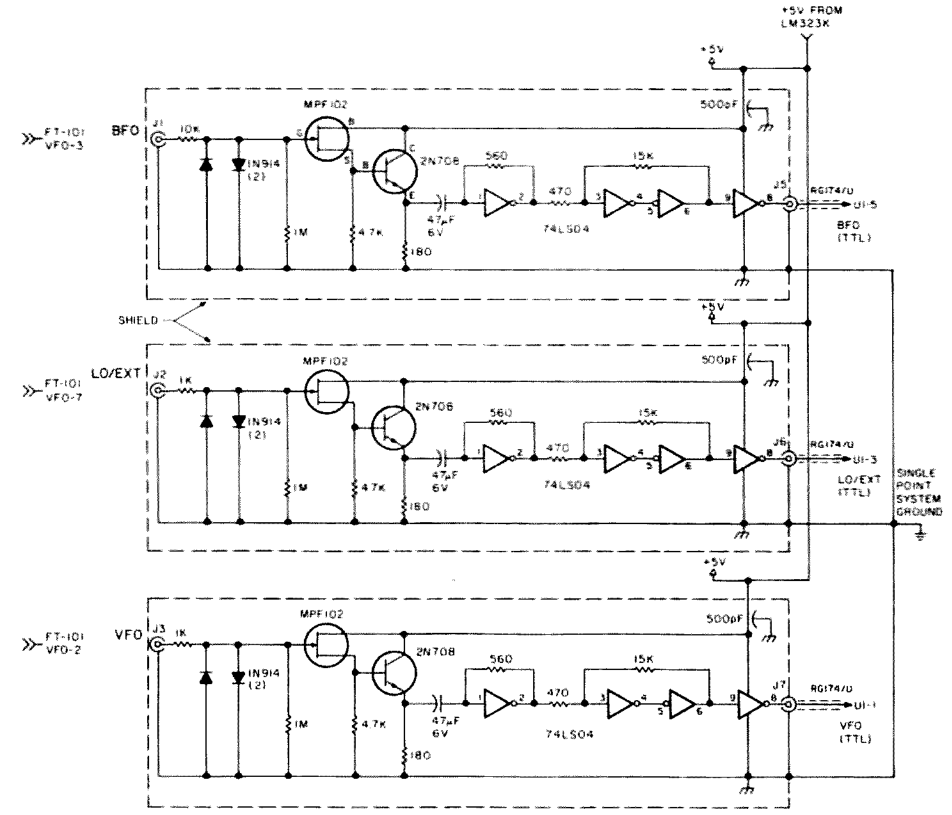


Fig. 3. Isolation amplifiers/TTL converters.

for display viewing and a $\overline{\text{LOAD}}$ pulse to prepare the 74LS192 up/down counters for the next display cycle. A bfo-detect interval is also defined that will determine whether the counter chips are to be loaded with zero or whether, in the absence of a bfo signal, the preset value of 031793 (the CW/AM oscillator frequency) is substituted for the bfo.

The two UP clock signals (bfo and LO) are multiplexed by U15, a 74LS158. The Q_A (U18-5) line selects the bfo when Q_A is a logical 0 (less than .8 volts), and the LO signal when it's a logical 1 (at least 2.7 volts). During the vfo (11) and Latch/Load (01) states, U15 is disabled, producing a solid logical 1 output. The vfo flip-flop, U9, is similarly disabled during the bfo, LO, and Latch/Load states. This action was necessary to properly condition the 74LS192 counters for up/down counting. Thus, for UP counting of the bfo and LO, the DOWN line is disabled, and during DOWN counting, the UP line is disabled.

The occurrence of the 01 state produces the LATCH command at U16-8, which stores the counter bits into 74LS175 quad flip-flops. U17 is the bfo detector, and if bfo activity was present during the bfo-detect interval, U17-8 will go to a logical 1, disabling U3. The disabled outputs of U3 will be all zeros and will be jammed into the 74LS192 counters (U22 through U28) when the $\overline{\text{LOAD}}$ pulse occurs later in the 01 interval. U17 is enabled only during the Latch interval (01 state) and, because of U10, only when the machine is in the FT-101 display mode. The extra U16 gates are used as a delay to ensure U3 output stability during activity of the $\overline{\text{LOAD}}$ signal.

The presence of two display times, together with the bfo-detection concept, was responsible for the inclusion of U3 and its strangely-named outputs. Table 1 shows how U3 (when wired as shown in the schematic) will (when no bfo signal has been detected) inject into the seven 74LS192 counters the value 0031793 when in the FAST mode (80-ms display update), and 0317930 when in the SLOW mode (800-ms update).

Fig. 4 shows the 74LS192s, the 74LS175 storage flip-flops, the 74LS247 decoder-drivers, current-limiting resistors, and common-anode right-hand decimal-point displays. The direct-drive approach was chosen to minimize the chance of display-driver RFI, which often is an unwanted result of the more efficient method of display-digit multiplexing.

Two decimal points are lit for each display mode: one to distinguish megahertz from kilohertz and one to separate kilohertz from Hertz. The FAST position illuminates decimal points on digits 5 and 2 while the SLOW setting drives digits 6 and 3. The decimal point switching and driving derive from a gate of U1 and an open collector-inverter, U2. The seven digits plus the four decimal points require 53 180-Ohm, ¼-W resistors. The displays are 8mm red 5082-7731 units, but any common-anode right-hand decimal-point displays will work.

Fig. 6 shows the power supply. An LM323K in a 15-Watt heat sink is ample for the maximum 2.1-Ampere current requirement. About 1.5 Amps is used by

		Fast/Slow* BCD Input				
Display Digit	**74LS192 Counter**	**D (pin 9)**	**C (pin 10)**	**B (pin 1)**	**A (pin 15)**	**Decimal**
7	U28	0/0	0/0	0/0	0/0	0/0
6	U27	0/0	0/0	0/1	0/1	0/3
5	U26	0/0	0/0	1/0	1/1	3/1
4	U25	0/0	0/1	0/1	1/1	1/7
3	U24	0/1	1/0	1/0	1/1	7/9
2	U23	1/0	0/0	0/1	1/1	9/3
1	U22	0/0	0/0	1/0	1/0	3/0

***Preset value: Fast: 0031793; Slow: 0317930. Above inputs are active when no bfo signal is present and counter is in FT-101 display mode. All counter-preset inputs are zero when in EXTERNAL mode, or when a bfo signal is present in FT-101 mode.**

Table 1. Preset counter bit values.

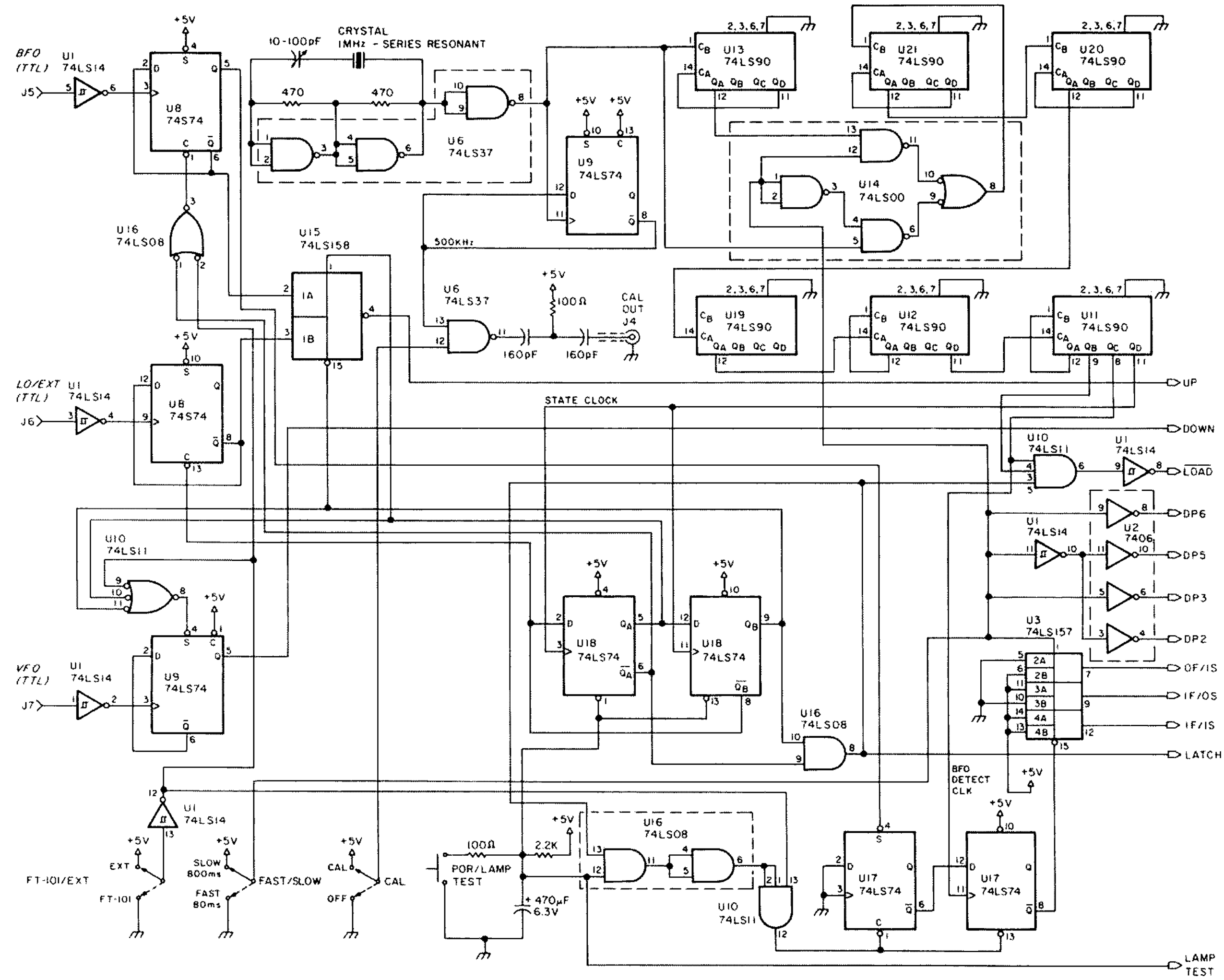


Fig. 4. Timing and control schematic.

the display during a lamp test, when all digits show eights. A 15-V center-tapped, 3-Amp transformer in a full-wave configuration was used. The ac primary is double-pole switched and fused for safety. A single-point ground system was employed to minimize the chances of ground loops.

The time base for the project is conventionally implemented from a 1-MHz TTL crystal oscillator (U6) and a cascaded string of 74LS90 decade dividers. U14 is wired as a 1-of-2 selector to change the frequency of final divider U11's outputs by a factor of 10 for the FAST/SLOW display presentation. An unused portion of U9 divides the 1-MHz oscillator signal by 2, then a remaining U6 gate buffers it and feeds a CRC differentiation network. When the CAL switch is activated, a 500-kHz harmonically rich signal is routed to the J4 output jack. This easily allows band-edge checks and frequency station-standard checks against WWV, JJY, CHU, etc.

Photo B. Rear view. Shown are the FT-101 inputs, the 500-kHz CAL output, and the operating controls. For frequency counter use, the toggle switch is set to EXT and the signal of interest connected to the LO/EXT input (photo by R. Campbell).

Construction and Checkout

The project was built in stages. The FT-101 interface was wired first. Many thanks to KH6BK (March, 1977, *QST*) for this simple but effective method of accessing the three FT-101 oscillator signals.

FT-101 interface instructions: The objective is to capacitively couple the bfo, LO, and vfo via small sections of RG-174/U coax routed through the underside of the chassis to the vfo accessory socket (J13) at pins 3, 7, and 2, respectively.

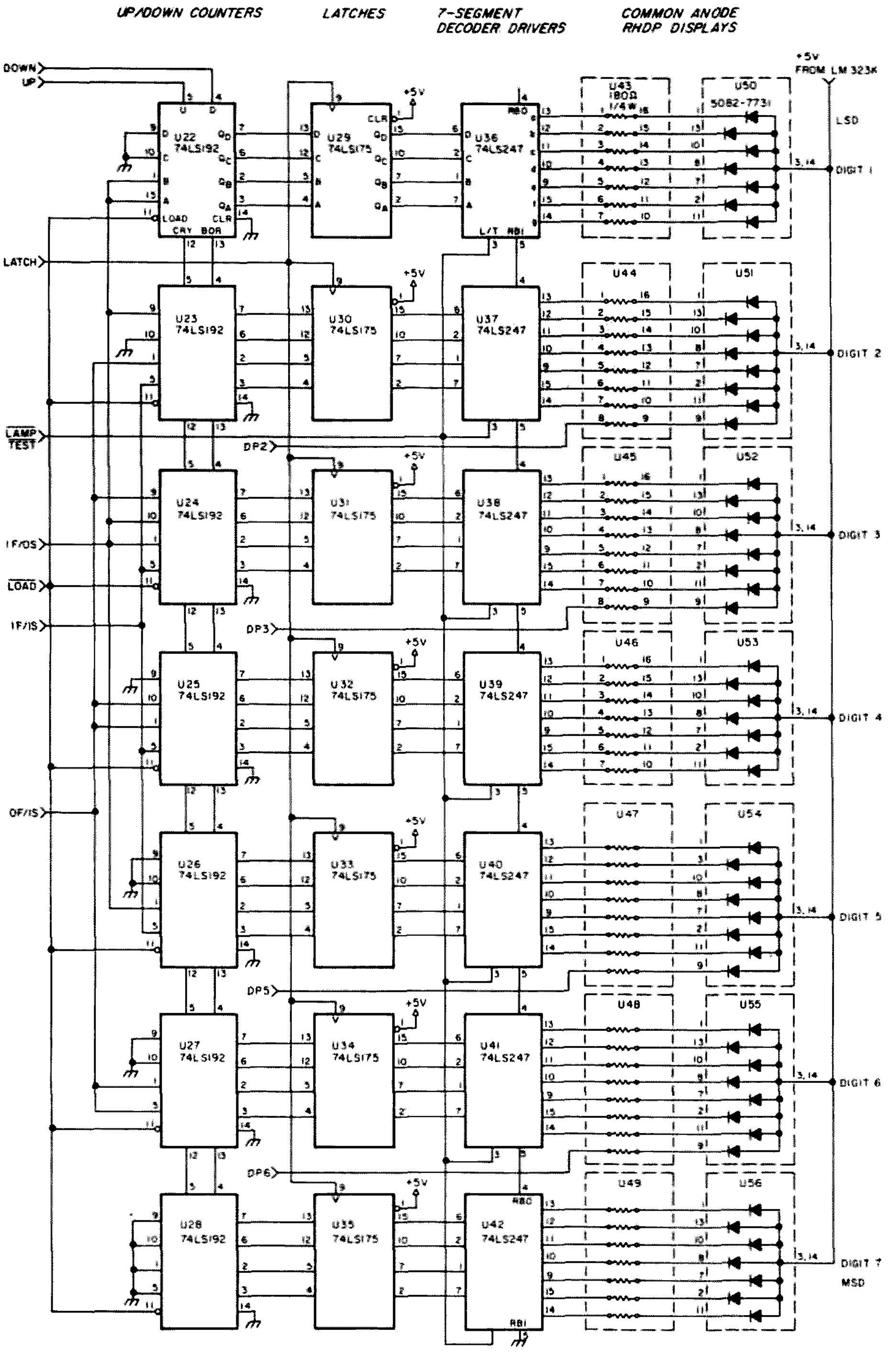


Fig. 5. Up/down counters and display schematic.

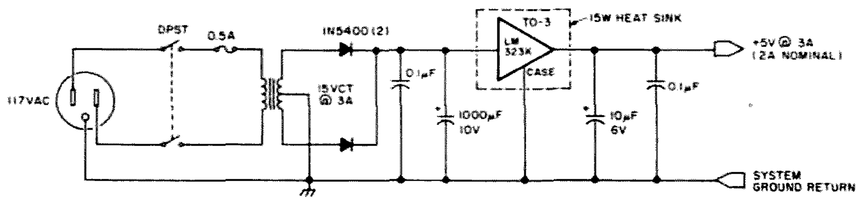


Fig. 6. Power supply.

The shields will be soldered to J13, pin 8. Dress and tin the leads for neatness.

(1)Bfo: Prepare a suitable length of coax and solder the inner conductor to one side of a .01-μF capacitor. Solder the other end of the capacitor to pin 6 of PB 1184A connector. Solder the shield to pin 7 (gnd). Route the cable to the octal vfo socket and solder the inner conductor to pin 3. Solder the shield to pin 8.

(2) LO: Prepare a length of coax and solder the inner conductor of one end directly to pin 15 of the PC connector for PB 1181A. Solder the shield to pin 18 (gnd). After routing the cable back to the vfo socket, solder the inner conductor to pin 7 and the shield to pin 8.

(3) Vfo: Prepare a length of coaxial cable. Solder the inner conductor to one end of a .01-μF capacitor. Solder the other end of the capacitor to pin 11 of the PC connector for PB 1180A (mixer). Solder the shield to pin 10. Route the cable to the vfo socket, soldering the inner conductor to pin 2 and the shield to pin 8.

(4) Remove PB 1181A. Solder a .01-μF capacitor between test point TP and pin 15. Replace PB 1181A.

The interface cable from the FT-101 to the VK8DE Calculating FT-101 Display consists of an octal plug, three equal sections of RG-174/U coax up to 1m in length, and three plugs. The plugs used in the prototype were BNC, but RCA shielded phono plugs would work. Prepare the plug ends of the cables, check for shorts, then solder the inner conductors to octal plug pins 2, 3, and 7. Label the cable to pin 2 "VFO," the pin 3 cable "BFO," and the pin 7 cable "LO," and solder the three shields to pin 8.

Plugging and unplugging the cabled octal plug at the external vfo socket will probably shift the receiver frequency a few Hertz. This is normal and merely re-

Parts List

FT-101 Interface
- 3 .01-μF disc capacitors
- 3 45-cm pieces RG-174/U

Interface Cable
- 1 Octal plug
- 3 1m sections RG-174/U
- 3 RG-174 BNC plugs

Isolation Amplifiers
- 3 Metal boxes[1]
- 3 5 x 2.5 cm fiberglass perfboard
- 3 BNC chassis jacks
- 2 1kΩ resistors
- 1 10kΩ resistor
- 3 1 M resistors
- 3 4.7kΩ resistors
- 3 180Ω resistors
- 3 560Ω resistors
- 3 470Ω resistors
- 3 15kΩ resistors
- 6 1N914 diodes
- 3 MPF102 JFETs
- 3 2N708 NPN
- 3 47-μF, 6-V capacitors
- 3 74LS04
- 3 14-pin solder-tail IC sockets
- 3 RCA phono jacks

Counter Board
- 1 1-MHz series-resonant crystal
- 1 10-100-pF (nominal) ceramic trimmer cap
- 12 .1-μF disc ceramic caps
- 3 RCA shielded phono plugs
- 3 15 cm RG-174/U
- 1 2.2k, ¼-W resistor
- 53 180Ω, ¼-W resistors
- 2 100Ω, ¼-W resistors
- 2 470Ω, ¼-W resistors
- 2 160-pF caps
- 1 20 cm x 12 cm glass epoxy board[2]
- 31 16-pin DIP wire-wrap sockets
- 23 14-pin DIP wire-wrap sockets
- 8 16-pin DIP component carriers (headers)
- 1 74LS37
- 1 74LS157
- 1 74LS158
- 1 7406
- 1 74LS14
- 1 74S74
- 1 74LS11
- 1 74LS08
- 3 74LS74
- 6 74LS90
- 7 74LS192
- 7 74LS175
- 7 74LS247
- 7 5082-7731 red CA displays
- 1500 cm wire-wrap wire

Power Supply
- 1 15 V CT @ 3 A transformer
- 2 1N5400 diodes
- 1 .5-Amp fuse
- 1 fuse holder
- 1 DPST switch
- 1 1000-μF @ 25-V capacitor
- 1 10-μF @ 6-V capacitor
- 1 15-Watt TO-3 heat sink
- 1 LM323K 5-volt, 3-A regulator
- 2 .1-μF @ 50-V disc capacitors
- 1 3-wire ac cord

Chassis
- 1 LMB CO-4A cabinet
- 1 9 cm x 2 cm red display bezel
- 3 SPDT toggle switches
- 1 rubber grommet for power cord
- 1 SPDT momentary switch[3]
- 1 100Ω, ¼-W resistor

Misc.
- 4 3-cm metal standoffs
- 4 2-cm metal standoffs
- 4 1.5-cm metal standoffs
- Screws, washers, bolts, wires, hand tools, solder, etc.

1. About 7.5 cm x 4.5 cm x 2 cm, similar to Bud 2100.
2. 2.54mm-spaced hole-drilled, similar to Vector 84P44WE.
3. Lamp test/power-on-reset.

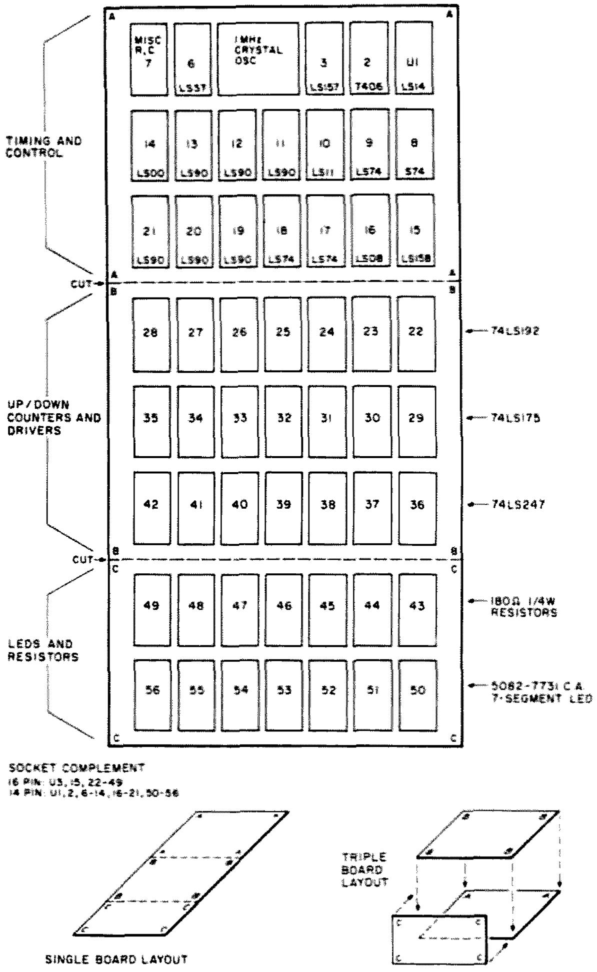


Fig. 7. Board options (component side).

flects the small change in oscillator loading.

The next step suggested is the construction of the three isolation amplifiers. Compact layout, either by printed-circuit etching or point-to-point wiring, is called for. A reasonable example layout for the amplifier from WA2FPT can be found in the September, 1982, *73*, on page 44. The three amplifiers were mounted in small metal boxes for shielding, with BNC inputs (J1, 2, and 3) and RCA phono-output jacks (J5, 6, and 7). RCA phono connectors could be used instead of BNC jacks to save a couple of dollars. The boxes were positioned at the rear of the cabinet so that J1, J2, and J3 would protrude into the enclosed compartments.

The board layout shown in Fig. 7 allows a choice of packaging. Using the single-board approach minimizes interconnections between pieces but requires a larger cabinet and right-angle sockets for the display LEDs. Cutting the larger board into three smaller sections, as shown by dotted lines, allows for a more compact chassis but more board-to-board wires. The prototype employed the three-board approach, mainly for aesthetics. Either way will work. Liberal use of .1-μF bypass capacitors is recommended—about one to every four ICs.

After the isolation amplifiers are built and working, the power supply should be built to allow checkout of the succeeding sections. Then the 1-MHz oscillator and decade divider chain can readily be wired. This prototype used wire-wrapping on a 2.54mm drilled fiberglass board (similar to the Vector 84P44WE), but it is not required. Years of home-brewing, however, point to a higher success rate with wire-wrapping despite the extra cost. Point-to-point construction would be somewhat cheaper and will definitely work but would probably require a larger layout. The choice is yours.

Power and ground wires to all ICs should be wired next. Use of a TTL data book is helpful, remembering that the wiring side is a mirror image of the component side.

The control section was wrapped next, and the timing diagram of Fig. 2 should

be referenced for verification. Access to a dual-trace-triggered sweep oscilloscope would be extremely helpful if substantial troubleshooting is anticipated (or necessary!). The last section connected is circuitry from Fig. 5, consisting of the 74LS192 up/down counters, 74LS175 latches, 74LS247 decoder drivers, the 180-Ohm resistors, and the displays. The front of the prototype contains only the display bezel to emphasize the "hands-off" design concept. The FAST/SLOW switch is a long "bat handle" type on the upper-rear center panel that is easily accessed by a finger flick. For even easier access, it could as readily mount on the front, centered beneath the display.

Operational checks are made by watching the display as the FT-101 is tuned. Upon the application of power, the display will briefly flash all 8s. When displaying frequency, the last digit will be plus or minus a digit, and will change at either the 80-ms fast rate, or every 800 ms, the slow rate. The 80-ms (12.5 Hz) updates will track any tuning rate generated by human hands. Moving the FT-101/EXT switch to the EXT position with the unit cabled to the FT-101 will display the particular LO crystal-oscillator frequency.

The bfo-detect circuit is checked by noting the difference in frequency as the FT-101 is switched from CW to AM. The AM position should read about 800 Hz higher than the CW display. When the CAL signal is input into the LO/EXT jack (J2) and the EXT switch activated, the counter should read exactly .500.00 in the SLOW position, and .500.00 in the FAST position. A short wire inserted into the CAL jack (J4) and placed near the FT-101 antenna input will couple the CAL signal into the FT-101, allowing bandedge checks. The 1-MHz oscillator can be trimmed against WWV in this manner.

Although any suitable-sized, well-ventilated metal cabinet could be used to house the display counter, those in the LMB CO series of two-tone gray cabinets are particularly appealing. The prototype is housed in the CO-4A model (20 × 18 × 10cm) which required careful, dense packaging. This line of cabinetry has a convenient sub-chassis that allows all the ac wiring to lie under the sub-chassis plate. A source for LMB cabinets is Tri-Tek,Inc., 7808 N. 27th Ave., Phoenix AZ 85021.

The VK8DE Calculating FT-101 Display can be built from all-new purchased parts for about US$100. A little scavenging can reduce that figure substantially, however. Areas of cost reduction are cabinetry and point-to-point wiring to avoid wire-wrap construction.

The project was conceived, designed, and built sporadically over a two-year period, allowing for some circuit refinement, and, admittedly, for economical parts acquisition. An "as-built" parts list appears in the box. My only regret is that it was not built sooner.

A display counter such as this one is well worth the effort for the home-brewing FT-101 owner. Variations on the conventional design themes used are quite feasible and are to be encouraged for the adventurous experimenter.

As the one and two "kilobuck" price barriers are regularly burst by new HF transceivers, investing a modest sum and a little work to modernize the venerable FT-101 seems a rather attractive alternative.

Happy digitizing!■

Strictly for FM Deviates

Ever wonder how the modulation is on your FM rig? Try this simple deviation meter and find out.

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Roseville MI 48066

Unlike AM-SSB, FM modulation monitoring on most rigs simply is not available. It's unusual to see audio-modulated transmitters without some indicator to monitor modulation. The opposite is true of FM transceivers. The only indication that your talk power is too high is distortion at the receiving end.

The FM deviation meter I built can be used for monitoring modulation, frequency offset between transmitters, etc. Its most attractive features pay off when, in conjunction with an audio-frequency generator, the transmitter is bench-checked for equal deviation on both sides of the carrier, maximum deviation, and audio distortion.

Amateur FM uses narrowband FM, ±5 kHz maximum deviation from the carrier. The instrument can measure ±10 kHz deviation at 146.52 MHz, the common direct 2-meter frequency. An audio output with 750-μsec de-emphasis is available for scope monitoring. Most parts are available from Radio Shack, coils and variable cap were purchased from Radio Kit, and the crystal from Sentry Manufacturing.

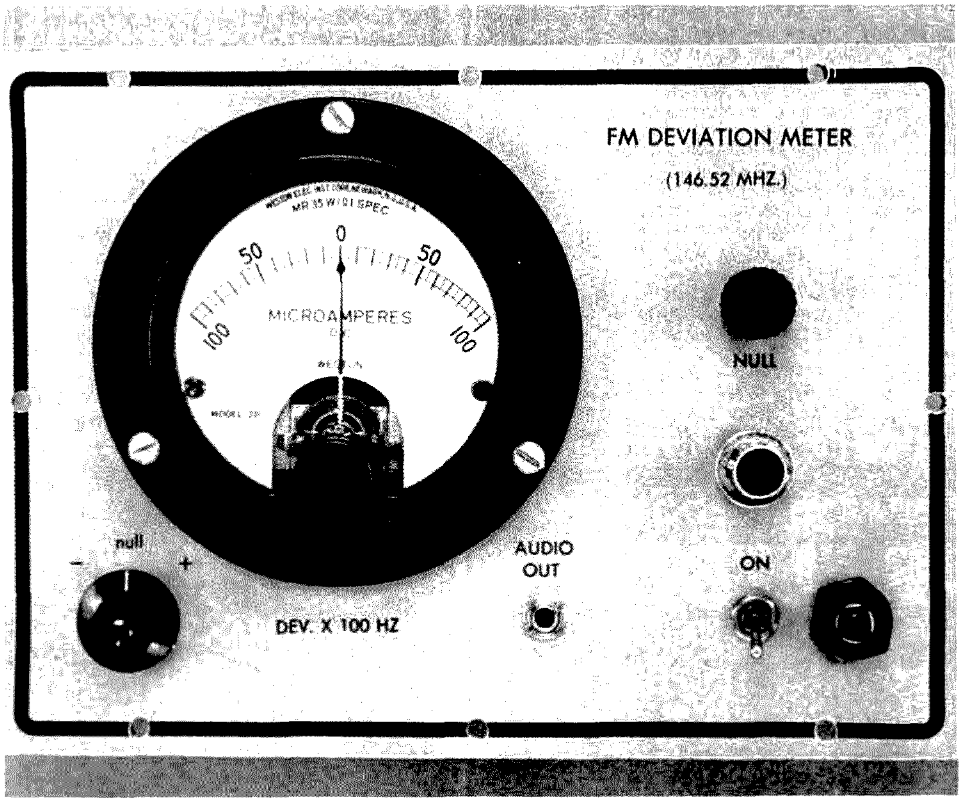

Photo A. Two-meter FM deviation meter.

The heart of the deviation meter is a 565 PLL FM demodulator listed as having a high linearity of demodulated output (0.2%). Calibration proved this out, better than 1% at the meter. The circuit uses the heterodyne method. A crystal-controlled local oscillator beats with the incoming signal and the resulting lower frequency FM is demodulated by the phase-locked loop. After filtering, a peak detector displays the maximum positive or negative frequency excursion of the incoming signal.

How It Works

The internal frequency generator starts with FET local oscillator Q2 at 14.655 MHz. The ouput tank circuit is tuned to the 5th harmonic; it drives doubler circuit Q1. The output is thus 146.55 MHz. The incoming signal with a carrier of 146.52 MHz and the local oscillator are lightly coupled into the mixing diode, D1, resulting in a beat frequency of 30 kHz. This signal has the modulation of the incoming signal. To minimize capacitive loading of the diode, the signal first goes through high-frequency choke L5 and

then low-pass filter L6-C24. Amplifier Q3 boosts the signal approximately 10 times.

The 565 PLL has a voltage-controlled oscillator center-tuned to 30 kHz with C16-R13-R14. Basically, the incoming signal is compared with this oscillator and a dc voltage is generated which is directly proportional to the frequency of the input signal. As the input frequency shifts, it is this output signal which causes the vco to shift its frequency to match that of the input. The peak voltage occurs at peak frequency deviation.

This demodulated audio signal is available at pin 7 of IC1 and is connected to the low-pass filter and to the audio output jack through deemphasis network R15-C21. Low-pass filter IC2a filters some 30 kHz noise generated within the PLL. The peak-detecting circuit, IC2b, charges C23 to either the positive or negative peak, selectable with switch S1. M1 essentially shows the peak voltage across C23.

The null mode of S1 is used for adjusting the difference between the unmodulated carrier and local oscillator to 30 kHz. The output voltage from the PLL at pin 7 is a dc voltage since there is no modulation. Amplifiers IC2a and IC2b works as straightforward dc amplifiers and M1 is calibrated at 30 kHz for zero reading with R16, an offset potentiometer. During use, zero adjust is made by changing the local oscillator frequency with C9, the null control.

Construction

A 7″×5″×3″ aluminum box is used for the enclosure. The oscillator is mounted on a separate board and is shielded from the rest of the circuitry. Feedthrough capacitors for power to the oscillator and the PLL input signal are used to prevent rf leakage. The shielding extends wall to wall of the enclosure; slits were filed in the box lip to let the shields slide through. Both oscillator coils were close-wound with #22 enamel wire. The top of the coil connects to

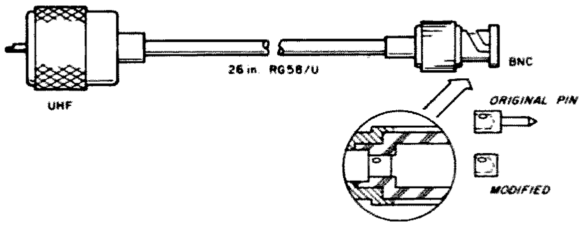

Fig. 1. Cable connectors.

the collector and the bottom end to the power supply. Tuned-circuit caps should be temperature-stable NPO discs or silver micas and are mounted at the coil with the shortest leads possible. The rest of the parts are mounted thorough the perfboard, bent over and soldered. The complete oscillator mounts on a 1.5″ x 1.75″ surface with ¾″-long spacers.

The mixing diode, D1, is mounted right behind the BNC connector. C1 reaches from the oscillator board, and L5 leads the signal to the PLL circuitry. D1 works best with a minimum of parallel capacitance. The PLL and meter circuitry together with the power supply also are mounted on perfboard. The parts are soldered to flea clips and are wired at the rear with a Vector wire pencil. All variable pots face the back for easy adjustment when the instrument is out of the enclosure. The meter is shielded from all the circuitry since rf could enter through its face.

The calculated value of the resistors used in the low-pass filter are shown on the schematic. The nearest standard value is listed in the parts list I used a borrowed LCR bridge to select C19-C22-R18-R19-R20 to within 1% of the calculated value. If this is not possible, use standard values and check the low-pass filter for flat response with an audio generator. With 1% parts, the response curve is flat to 2 kHz, drops to approximately

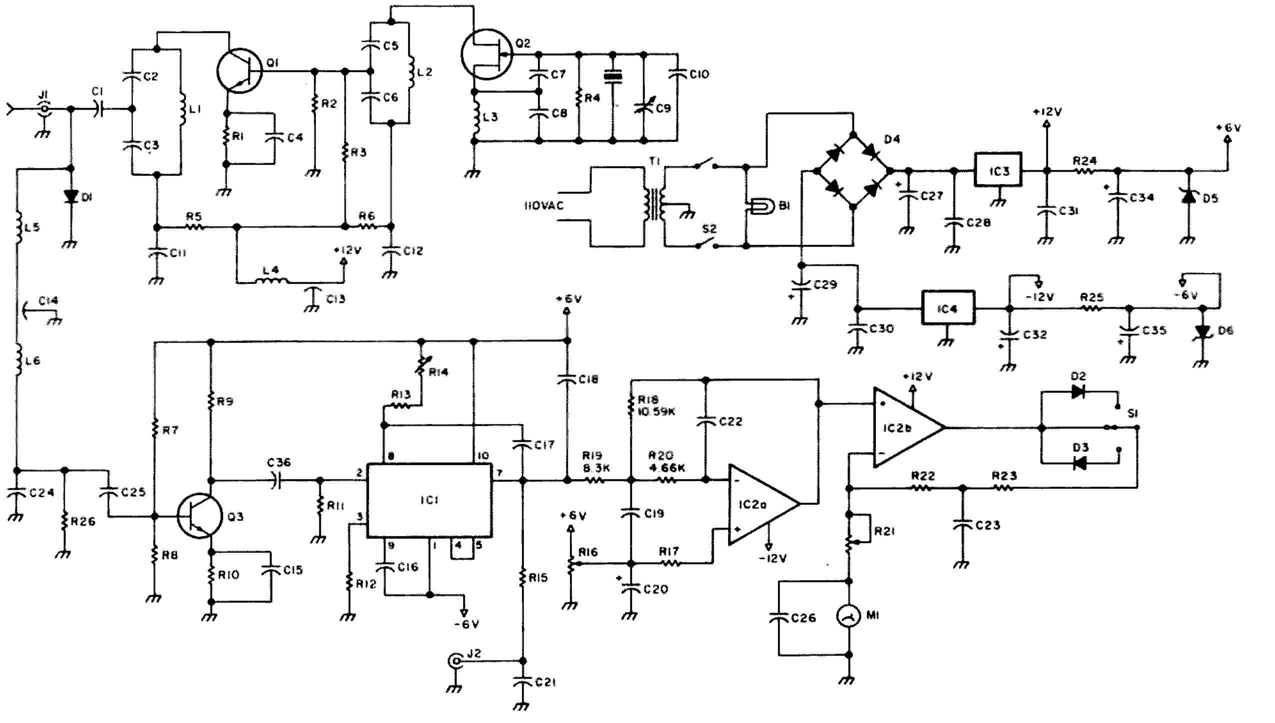

Fig. 2. Schematic.

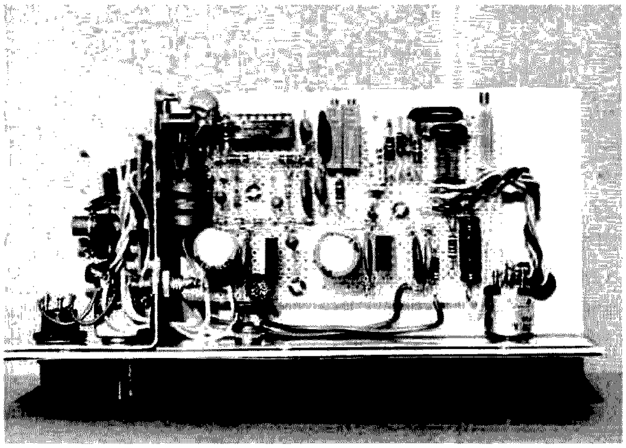

Photo B. Bottom view. Signal enters through C14 feedthrough. PLL circuitry and power supply are mounted on one board.

94% at 3 kHz, and 70% at 5 kHz. For accurate measurements of deviation, an audio tone of less than 2 kHz should be used. I used a 1.8-kHz "Sonalert" piezobuzzer right into the microphone. These units output a clean sine-wave tone, easy for a quick test.

The power-supply transformer is mounted in the back of the box, oscillator section, and is connected with a 3-pin molex® connector. The center tap is grounded to the box at the transformer. The connecting cable is constructed from 26" of RG-58/U cable. As shown in Fig. 1, a UHF connector is soldered to one end. This will connect to the T installed at the dummy load. The instrument end has a BNC with the center pin cut short; it does not connect to the mixing diode directly but is capacitively coupled. Mounting different connectors prevents incorrect installation. The cable should be ½ wavelength since, as a stub, it affects the swr. Never connect a regular feedthrough cable as it will blow the diode.

Special attention was paid to shielding. The instrument can be used with a small antenna and held within a few feet of the transmitter. The rf noise pickup, however, is a problem and can cause unpredictable meter readings. The best way is to use a tapped dummy load with coax connections and good shielding practices.

The microammeter is a 100-0-100 movement liberated from a local surplus store for $3.50. It is an accurate movement and originally came from a General Radio instrument. An off-center scale movement can be used but extra contacts will be needed on S1 to reverse the meter.

The parts are readily available. D1 is a UHF mixer diode purchased from a local Radio-TV supply firm. The negative voltage regulator and 10-turn pots are available from mail-order electronic parts suppliers. Coils, chokes, and caps are available from Radio Kit, Box 411S, Greenville NH 03048. They have a small catalog listing radio parts which are almost impossible to obtain elsewhere. Radio Shack fills out the remainder of the parts list.

Calibration and Use

The PLL was calibrated with an audio generator monitored by a frequency counter. A 30-kHz audio tone of approximately 40-mV p-p output is fed into amplifier Q3 at R26. L6-C24 is disconnected. Pin 7, IC1 is monitored with a dc voltmeter and R14 is adjusted to a point where there is no change in voltage between the audio tone connected and disconnected. This establishes the internal vco of the PLL at 30 kHz. Switch S1 is turned to center position, or null, and R21 is adjusted at approximately the midpoint of its resistance range. M1 is now adjusted for zero, or null, with R16.

Parts List

B1	24-V power-on indicator	Fair Radio—Holder 6210-617-0934 and lamp (#327)	.78
C1	3.3-pF disc	Radio Kit	.20
C2	5 pF (May	Radio Kit	.50
C3	50 pF be	Jameco	.35
C5	15 pF disc,	Jameco	.35
C6	33 pF NPO,	Jameco	.35
C7	25 pF or	Jameco	.35
C8	100 pF silver mica)	Jameco	.35
C9	1.8-8.7-pF air variable, null control (Hammarlund MAC-10 or equiv.)	Fair Radio 228-6085	1.25
C10	5-pF disc, NPO, or silver mica (see text)	Radio Kit	.50
C4, C11, C12	500-pF disc	Jameco (3 @ .08)	.24
C13, C14	100-pF feedthrough capacitor	(2 @ .25)	.50
C16	.0022 μF	Jameco mylar™.	.12
C17	1000 pF	Jameco mylar	.12
C18	.01 μF	Jameco mylar	.12
C19	.01 μF (see text)	Jameco mylar	.12
C20	1-μF, 16-V-dc tantalum or electrolytic	Jameco	.15
C22	.0022 μF (see text)	Jameco	.12
C23	10-μF non-polarized electrolytic	Radio Shack	.99
C24	.003 μF	Digi-Key M1332	.14
C15, C25, C36	.02 μF	Jameco mylar (3 @ .13)	.39
C26	.1-μF disc, mounted at meter terminals	Jameco disc	.12
C27, C29	220-μF, 25-V-dc electrolytic	Jameco (2 @ .39)	.78
C21, C28, C30, C31	.05-μF disc	Jameco (4 @ .09)	.36
C32, C34, C35	4.7-μF, 16-V-dc tantalum or electrolytic	Jameco (3 @ .15)	.45
D1	1N84 diode (ECG 112)		1.00
D2, D3	1N914 or equiv.	Jameco (2 @ .07)	.14
D4	1-A, 50-piv bridge rectifier	Radio Shack	.89
D5, D6	6-V zener diodes 1N4735	Jameco (2 @ .25)	.50
L1	4½ turns, #22 enamel wire close-wound on J.W. Miller 20A000-4 core	Radio Kit	3.30
L2	7 turns, #22 enamel wire close-wound on J.W. Miller 20A000-4 core	Radio Kit	3.30
L3	100-μH rf choke (J.W. Miller 74F104A1)	Radio Kit	1.45
L4, L5	1.72-μH rf choke (J.W. Miller RFC-144)	Radio Kit (2 @ 1.75)	3.50
L6	2-mH rf choke (J.W. Miller 4666)	Radio Kit	2.40

Vary the audio generator above and below 30 kHz and note the meter movement. An increase in frequency should show an increase in meter movement, a frequency decrease, a decrease in meter movement. If it is the reverse, interchange D2-D3 wires to S1.

Set the audio generator at 35 kHz and adjust the meter reading to 5 kHz with R21. Turning S1 to + deviation should not have any effect on the meter reading. Conversely, adjust for 25 kHz and note a negative meter reading of 5 kHz in null, or −, deviation. Slowly decrease the frequency to 20 kHz. The meter should come close to 10-kHz deviation and then suddenly return to zero. The PLL has lost control at that point.

Set the audio generator 1 kHz below the point the PLL loses control and now slowly decrease the input voltage. Again at some input level the PLL will lose control. Carefully note this voltage; it is the minimum voltage required to give full-scale indication. It could be as low as 5-mV p-p. For reliable operation, the voltage from the mixing diode, D1, should be at least four times this minimum level. I checked the meter in 1-kHz steps and found the calibration better than 1%.

Reconnect the L6-C24 filter to R26 when the calibration is completed. The local oscillator is tuned up by first turning the tuning slugs all the way in. R26 is monitored with a dc voltmeter, and L2, L1 is tuned for a peak reading of approximately ¼ volts dc. Make sure the output is the 10th harmonic or 146.55 MHz, with a wavemeter or such, and not the 11th or 9th harmonic.

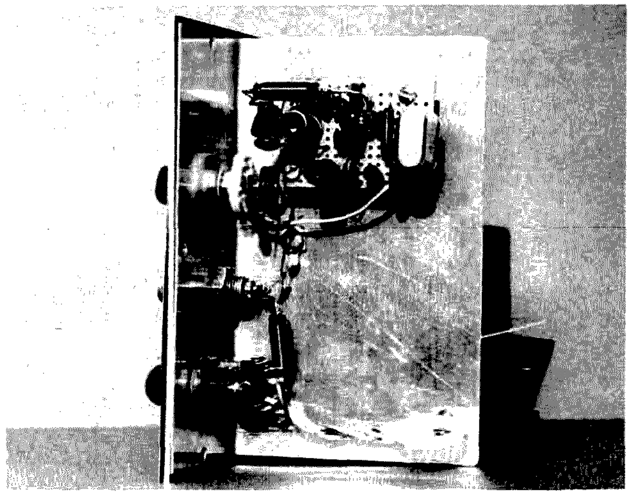

Photo C. Right side—the internal frequency generator. C1, D1, and L5 are shown connected to the BNC connector. L4 at the left top supplies power through feedthrough C13. The molex connector at the bottom connects to the transformer.

The transceiver is now connected to the dummy load with a T connector. Attach the special cable and tune the transceiver to 146.52 MHz direct. Set C9, the null control, at half capacitance. Attach a scope to resistor R26. The scope, during transmit, should display a sine wave of approximately 40-mV p-p amplitude and a frequency above 30 kHz. A value of 5 pF for C10, installed across C9, should bring the frequency to about 30 kHz. The idea is to have C9 in the middle of its operating range.

At this point, we are ready to try measuring deviation. I tested a 10-Watt unit and a 2-Watt hand-held in high and low power. With the deviation meter switched to null, push to transmit and zero the meter with the null control. Turn to + deviation and hum loudly into the microphone. The meter will show maximum positive deviation. Turn to − and repeat for negative deviation. The reading should be the same, and at 5 kHz.■

Q1	MPS 918	Radio Shack	.89
Q2	MPF 102	Digi-Key	.54
Q3	2N3904 or equiv.	Digi-Key (2 @ .20)	.40
IC1	LM565 PLL	Jameco	1.19
IC2	1458 dual 741	Jameco	.59
IC3	LM340T12	Jameco	.79
IC4	LM7912CT	Jameco	.89
R1	470-Ohm, ¼-Watt resistor, 10%	Jameco	.06
R2, R10	1k	Jameco (2 @ .06)	.12
R3, R17	10k	Jameco (2 @ .06)	.12
R4	150k	Jameco	.06
R5, R6	100	Jameco (2 @ .06)	.12
R7	33k	Jameco	.06
R8	8.2k	Jameco	.06
R9	6.8k	Jameco	.06
R11, R12, R13	4.7k	Jameco (3 @ .06)	.18
R15	15k	Jameco	.06
R22	47k	Jameco	.06
R23	100	Jameco	.06
R24, R25	390	Jameco (2 @ .06)	.12
R14	5k 10-turn pot, PLL frequency adjust	Jameco 43P	1.19
R16	5k 10-turn pot, meter null adjust	Jameco 43P	1.19
R21	20k 10-turn pot, meter calibrate adjust	Jameco 43P	1.19
R18	10k (see text)	Jameco	.06
R19	8.2k (see text)	Jameco	.06
R20	4.7k (see text)	Jameco	.06
T1	24-30-V-ac c-t transformer	Radio Shack	3.99
Xtal	14655.00-kHz crystal (parallel resonance, 32 pF)	Sentry Mfg., Chickasha OK 73018, Ref. 289590	8.00
Chassis	BUD AC-429		6.10
S1	SP-3T miniature rotary switch	Radio Shack #275-1386	1.19
S2	DPDT miniature toggle switch	Radio Shack #275-626	1.99
J1	BNC connector, chassis mount, female	Radio Shack #278-105	1.59
J2	1/8" miniature phone jack	Radio Shack #274-251	.45
M1	100–0–100-μA dc meter*	Radio Shack 0–50-μA meter	8.95

*Fair Radio lists several 0–50-μA or 0–100-μA movements. Meter-reversing switch arrangement is needed. Switch S1, Radio Shack 275-1386, can be used.

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Build a Better Hamfest

These hints from 25 years of experience will help make your event a success.

After over a quarter of a century of hamfest attendance as a spectator, retail exhibitor, manufacturer, and hamfest committee member, I have been asked numerous times to put down a few thoughts as to what I and other exhibitors liked and disliked. I will comment mostly from the point of view of exhibitors, as they probably have the least input to a hamfest committee.

Every committee *wants* to do the very best job, and most put in lots of effort and time with the very best of intentions. I can remember several hamfests that really bent over backwards to give the exhibitors maximum exposure to the public. We could set up all day Friday, open the exhibits Friday night, 6:00 to 10:00 pm, open Saturday, 8:00 am to 6:00 pm, have a Saturday night party, and be open on Sunday from 9:00 am to 5:00 pm.

The committees in these instances really did mean well and had good intentions, but if an exhibitor has to fly in or drive many hours Friday to set up, the last thing he needs is to open the exhibit area Friday night. He is ready to collapse for awhile and get ready for Saturday and/or Sunday. After all, he probably worked the last 5 days also. Saturday 9:00 am to 3:00 or maybe 4:00 pm is enough for one day of standing around trying to be alert and cheerful!

Several hamfests have a Saturday night cocktail party with a free bar for the first hour for the exhibitors only, then open it up for the rest of the attendees with a cash bar. This has worked quite well in most cases and is certainly a good way to show appreciation to the exhibitors. And best of all, key members of the committee can be there to get information as to what the exhibitors like and dislike about the hamfest and get suggestions of how to make next year's better.

Now here is something which could be *very* important: A few small exhibitors may have only one person in the booth and it is *very* difficult for them to take coffee or rest breaks. Some hamfests have local Boy or Girl Scouts or C.A.P. squadron members to help out. Such local community groups often are looking for things to do and would be happy to help man a booth and watch things for a few minutes—or go and get coffee, donuts, or a sandwich.

Some committees arrange to have coffee and donuts for the exhibitors and bring them to the booth or have it available in a central location; some even have a room where exhibitors can sit down and relax for a few minutes.

I certainly do not mean to imply that all or any committees should do all of the things mentioned here. They are things that I have observed over the years and are meant only as food for thought. And some of these ideas are more important than others. For example: It would be a very useful and desirable thing if all hamfest organizers provided some means for exhibitors to be reached in an emergency situation. A telephone situated in the display area or, at the very least, near the PA system would be one possibility. Another possibility would be a telephone located near the person who is running the radio talk-in operation. Perhaps both locations could be covered. In any case, there have been emergencies at almost all hamfests where exhibitors had to be reached quickly. Some thought should be given to this problem.

Hamfest Dates

There are times when it is difficult or impossible to coordinate your event with others on the same date. You could be locked into a date by the facilities that you use. Last year there were several hamfests that had the same dates as others that we wanted to attend as exhibitors. I am sure that situations like this will continue as it is very difficult to arrange no-conflict dates. It helps, however, if you get your date out and announced ASAP. Keep plugging this date in publications and on the air if it is a large affair that you want the big manufacturers and dealers to attend. Make sure that they know the date of the next one ASAP after the last one. Some commitments (such as ARRL national conventions) are made more than a year in advance by exhibitors.

Security is a major concern with many exhibitors, and rightly so since some have many tens of thousands of dollars worth of equipment on display. During setup times, I have observed many people walking around convention areas without benefit of any ID (committee, exhibitor, or general public). *I think this is a real no-no,* for two reasons. First, when you are trying to set up your area, the last thing you need is a distraction, especially by curious committee members or

other exhibitors who probably are not customers. They may mean well, but as I said before, an exhibitor may have left before the chickens got up that morning and perhaps drove or flew many hours before arriving for a weekend hamfest. He may also have worked the week before and maybe the last several weekends in the hamfest season.

Second, it seems that over the last few years the need for more and better security has increased drastically. I'm not sure why; maybe it's just the economy, or maybe, with our lack of ability to enforce our laws and prosecute shoplifters, more people are willing to take a chance. Anyway, could it be time to need a bill of sale on your person for your new-looking HT as you walk in and out of the exhibit area? Time for a bill of sale for *any* package, box, or equipment that you carry in and out of the exhibit area? I certainly hope not, but the Consumer Electronics Show and others have had to take this approach, with guards on the doors doing briefcase inspections, etc.

Last year I went to numerous hamfests that had equipment stolen right off displays during show hours. At the Cedar Rapids national ARRL convention last summer, a sharp-eyed and concerned attendee witnessed an HT slide off a display and into the wrong person's possession. He reported it to the exhibitor who immediately gave chase and ran the person right into the arms of a policeman. I don't know if there was a prosecution or not, but the name *and call* of the individual were known by a lot of exhibitors in very short order.

In your flyers or exhibitor packages, a map of your location with respect to the local airport, expressways, and major landmarks is certainly nice—along with approximate times and mileages from them. A list of local motels, hotels, and *nice* restaurants along with any 800 numbers and local numbers, rates, and specialty menus would make it easier for a stranger to make a choice to meet his needs or desires. Quite often, you can arrange a block of rooms, especially in a dead season, and you can really get a price break.

SAROC used to hold its convention the first week after New Year's Eve—the slowest weekend in Las Vegas—and got super room and exhibit-area rates. (Now CES has taken this time slot for the very same reasons.) So don't overlook the expensive convention areas if you can use them in their slow times; a little income for them is better than zero. But be careful of union-contract areas. The exhibit area may be inexpensive, but the electricians and dray people may turn out to be very expensive.

An absolute must for good rapport with the commercial exhibitors is a thank-you-for-coming letter sent *no later* than 30 days after the hamfest. It also gives you the excellent opportunity to include a questionnaire: How did you like the hamfest? What could stand improvement? What services or functions would you like to see added or dropped? Was there anything *exceptionally* good or bad? Did you like the location and facilities? The list can go on and on.

If you use a form letter that requires only a check mark (✓) for yes or no and includes space for comments, you will get a better response. If you ask only for written comments, don't expect very many to answer you. Make it easy for the busy exhibitor to respond.

It is certainly appreciated when at least one person from the committee takes time and comes around once or twice, minimum, to each booth and *asks* if there is anything needed or wanted to make it a better show. Such visits should not interrupt a sale or a serious conversation. Committee members should wear some kind of ID to let exhibitors know who they are. And they should try to talk with the boss, if possible; all such good efforts might be for naught if only the hired help is seen when the boss might have something he feels is important to chat about.

Make sure, in all correspondence to exhibitors, that there is a phone number, name, and address of a responsible person who can make commitments for the event or at least will follow up with a prompt response. If you have a large event, supply a committee list of chairpersons complete with phone numbers and addresses and their responsibilities.

Booth fees at some events are negotiable, and at some they are not. Almost all hamfests need door prizes that have to come from someplace, and trading for them with booth space is probably one of the best ways to stretch a hamfest budget. I think that most dealers or manufacturers would rather trade merchandise than pay cash for a booth. There are bookkeeping problems on both sides sometimes in doing this, so play this one by ear to satisfy both sides.

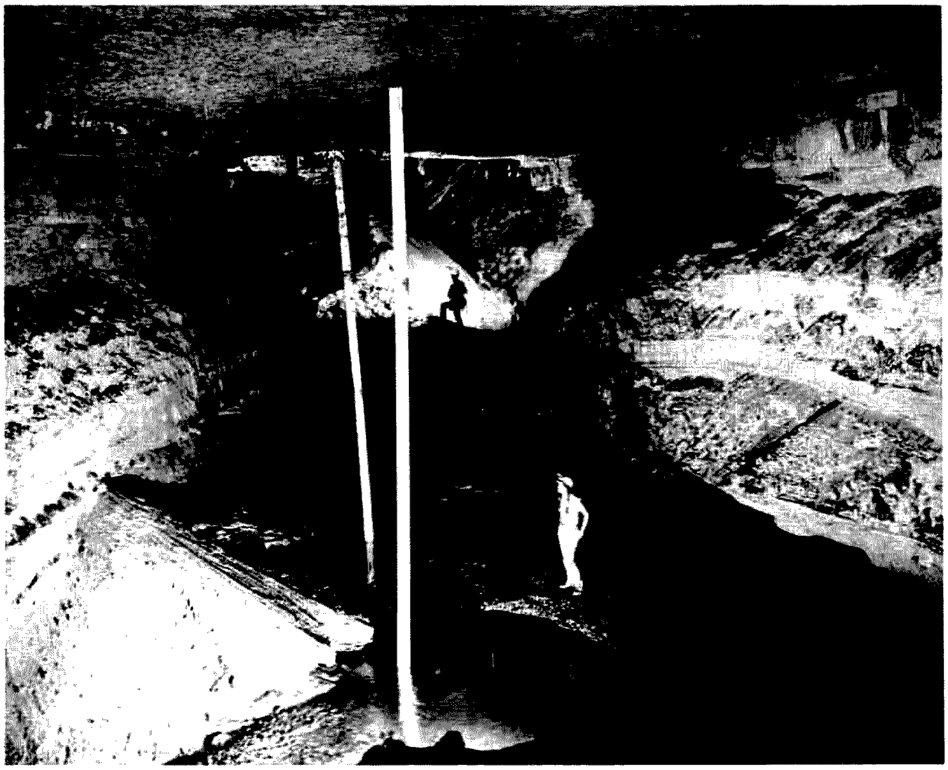
In conclusion, I'd like to add that hamfests are fun for all concerned, and a little more attention to some of the details can turn a mediocre hamfest into a spectacular show satisfying to exhibitors, committee members, and hams alike. I hope that some of these ideas and comments will help your hamfest become the most successful and talked-about one this year and for years to come. ■

Caveman Radio

With underground inductive transmission, 300 feet is almost DX.

Frank S. Reid W9MKV
PO Box 5283
Bloomington IN 47402

Magnetic-induction equipment which transmits signals through the ground is a valuable aid to cave-mapping and underground rescue. Even more useful than its communication ability is its ability to accurately find a spot on the surface above an underground transmitter. It can also determine depth within a few percent, using field-geometry measurements.



120-foot-deep wells near Park City, Kentucky, penetrated cave within two feet of radio targets. Drill drift caused error. Pipes contain hydrological instrumentation. (Photo by Samuel S. Frushour)

It's legal! Magnetic induction is not real radio—it's simply very-loosely-coupled transformer action. The FCC does not define equipment operating below 10 kHz as "radio frequency devices."

How It Works

Inductive communication is a very old technique (see "Who Really Invented Radio?—The Twisted Tale of Nathan B. Stubblefield," *73*, December, 1980). When amateur radio was banned during World War II, many hams communicated by "ground wave," i.e., magnetic induction and earth-current. ("Earth-current" is transmission of audio-frequency signals through the ground between pairs of widely-spaced ground rods connected to amplifiers.) Ranges greater than one mile were claimed.

Skin effect, which causes rf currents to travel only on the surfaces of conductors, normally prevents radio waves from penetrating ground or water more than a few feet. The depth of the "skin" increases as frequency is lowered; thus, submarines can receive transmissions from very powerful VLF stations. Experimenters have reported successful cave-to-surface communications on 160 meters. Others report positive but unpredictable results on higher frequencies.

Audio-frequency magnetic fields penetrate most geologic structures easily. There are methods for locating ore bodies, using magnetic-induction equipment as a sort of giant metal-detector (see *QST*, June, 1928).

Inductive communication is inherently short-range because magnetic dipole field strength decreases as the *cube* of the distance from the source, unlike radio waves which obey an inverse-square law. Conductive overburden will absorb the signal, but the inverse-cube attenuation is so predominant that absorption is rarely noticeable. Generating true radio (electromagnetic) waves at audio frequencies would require enormous antennas.

E. R. Roeschlein suggested using the directional properties of magnetic fields to map caves in an article in *Electronics*, September 23, 1960. Cavers, notably William Mixon and Richard Blenz, refined the equipment and developed depth-measuring techniques which are independent of signal strength (several articles appear in *Speleo Digest*, 1964).

Equipment

It's easy to get 300-foot range with very simple equipment. Longer ranges are more challenging.

A transmitter is just an audio oscillator driving an amplifier which is driving a coil. Impedance matching is important for maximum coil current. Perhaps the most important part of the transmitter is the keyer—a circuit to make it go "beep . . . beep . . . beep." In addition to the advantage of saving battery power, a pulsed signal is much easier for the receiver operator to distinguish against a background of interference than is a steady tone.

A simple resonant coil connected to an audio amplifier will work for a receiver. Use crystal earphones, because magnetic phones will cause feedback.

The circuit of Fig. 1 is a Q-multiplier. The resonant circuit is in *negative feedback* instead of being simply connected to the amplifier's input. The Q (regeneration) control taps some of the output and feeds it back to the noninverting (+) input. The amplifier forms a *negative resistance* which cancels the resistance of the coil. As the Q control is advanced, sensitivity and selectivity get higher and higher until the circuit goes into oscillation (infinite Q). Since it will oscillate, the circuit can also be used as a very-low-powered transmitter.

A 60-Hz notch filter will *not* get rid of power-line in-

WB9TLH operates underground transmitter on 3500-Hz CW, using microswitch for telegraph key.

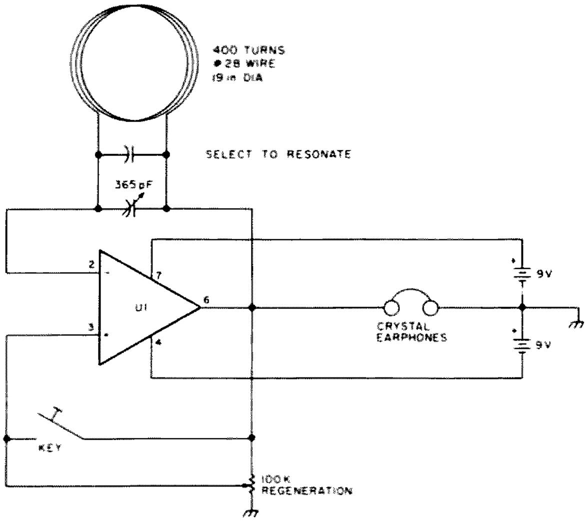


Fig. 1. One-chip transceiver uses Q-multiplier effect for high sensitivity and selectivity. Antenna needs no electrostatic shield. U1 is any 741-type op amp.

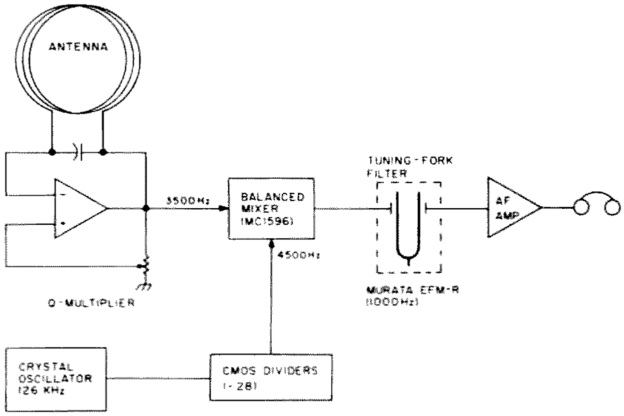


Fig. 2. Receiver with frequency conversion allows very high gain without feedback problems.

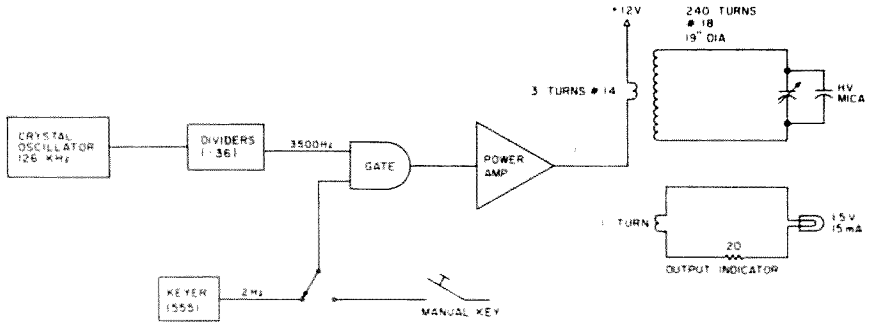


Fig. 3. A cave-radio transmitter. Precise frequency control is necessary if receiver uses very-narrow-bandwidth filters.

terference, which is not just 60 Hz but many harmonics. Don't use active filters indiscriminately. Very strong interference can *intermodulate* with the desired signal in an active filter, creating even worse interference.

Even with crystal earphones, receiver gain cannot be increased indefinitely. After a certain point, no amount of shielding and decoupling will prevent feedback. You can keep the antenna far from the amplifier, but then it's not portable. A balanced mixer and local oscillator can convert the input frequency to some other frequency, which can then be filtered and greatly amplified without feedback problems. Fig. 2 is a block diagram of one such receiver.

Interference

Power lines are the major source of interference, even in isolated areas. Harmonics of 60 Hz extend well into the ultrasonic frequencies. Power-line interference is usually directional and can be partially nulled out by the receiving antenna. To minimize interference, choose an operating frequency *in between* a pair of power-line harmonics and use a receiving filter narrow enough to reject the adjacent signals. Resonant-reed or tuning-fork filters of the type used in radio pagers can provide the necessary selectivity. Such extremely narrow bandwidths require precise frequency control and very slow CW speeds.

Surface location and depth of transmitter are found by null-seeking with directional antenna and by measuring shape of magnetic field.

Atmospheric noise from distant thunderstorms can be a problem in summer. Daytime atmospheric noise is minimal around 3.5 kHz (*National Speleological Society Bulletin*, vol. 32, no. 1, January, 1970). The noise level increases appreciably after dark. Atmospheric noise is polarized such that it nulls when the receive coil is horizontal.

What's the best frequency to use? Mid-range audio frequencies work well, and the equipment is easy to build. I use 3500 Hz. 3276.8 Hz would be a good frequency because it is easy to generate from a 32.768-kHz wristwatch crystal. 3276.8 Hz falls in between harmonics of both 50- and 60-Hz power lines, and so could be used in any country. At higher frequencies, ground absorption increases and audio amplifiers become less efficient. Some experimenters have tried SSB on ultrasonic frequencies, but have found no advantages to justify the complexity of the equipment. Below 2 kHz, atmospheric noise and power-line harmonics are very strong. Subaudible frequencies below 60 Hz have been used, with very complex receiving equipment.

The OMEGA navigation system transmits very strong signals on several frequencies between 10 and 14 kHz. OMEGA stations make good beacons for testing receivers. Each station transmits for one second in a sequence that repeats every ten seconds.

Antennas

For best performance, maximize the *magnetic moment* of the coils. Magnetic moment is Ampere-turns multiplied by the coil's area.

Doubling the range of an inductive system requires an eightfold increase in magnetic moment, other factors being constant. Self-resonance limits the number of turns a coil may have. An eightfold increase in current implies either much larger wire or a 64-fold power increase. It's easy to see that

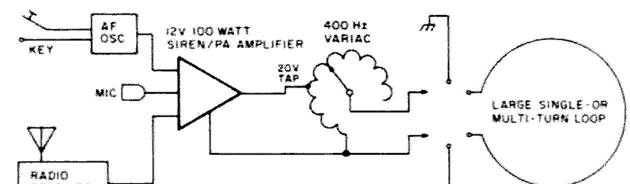


Fig. 4. Surface-to-cave transmitter uses large antenna and high power, so that underground equipment can be small. Surplus 400-Hz transformers are very cheap or free because there is little demand for them. (Caution—possible shock hazard between chassis and earth grounds if amplifier has no internal output transformer.)

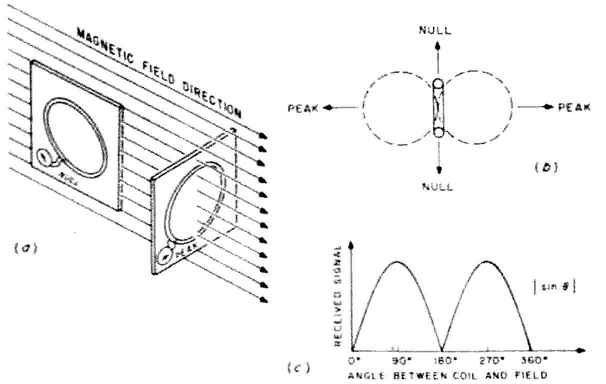


Fig. 5. (a) Received signal disappears when coil is parallel to magnetic field. (b) Note that magnetic-induction receiver coil's sensitivity pattern has null directions in the plane of the coil, unlike radio loop antennas. (c) Nulls are much sharper than peaks, but with very weak signals you may have to seek peaks instead of nulls.

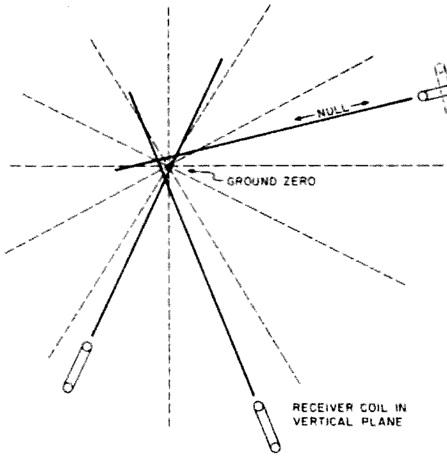


Fig. 6. Finding the approximate surface point above the transmitter (plan view).

the brute-force approach soon reaches limitations.

For a given length of wire, the optimum antenna is a single huge circular turn. Very large loops are OK for fixed locations, but coils for direction-finding must be rigid, flat, and portable. Transmitting coils must be small enough to fit through tight cave passages. In any case, the easiest route to long range is with coils of the largest manageable diameter. Build a transmitter of a few Watts, carefully match it to the coil, and concentrate the rest of your effort on a good receiver.

Ferrite-core antennas should perform well if properly designed. Ferrite cores can introduce problems of temperature instability, microphonics, and magnetic saturation. Doug DeMaw's recent book, *Ferromagnetic-Core Design and Applications Handbook*, published by Prentice-Hall, is an excellent reference.

Nathan B. Stubblefield may have discovered the interesting interaction between the magnetic-induction and earth-current modes of communication: Current injected into the ground between a pair of widely-spaced rods flows around a large underground area, creating a large magnetic moment. An inductive receiver will detect the signal. Likewise, a pair of ground probes can detect voltage induced by a distant current-carrying coil. Some cave-radio experimenters have built equipment which operates in either mode, allowing greater flexibility in varying conditions of ground conductivity.

Receiving antenna has inclinometer made from vernier radio dial and spirit-level for measuring vertical angles.

Voice Operation

My own equipment was designed primarily for direction-finding and minimum weight. It can transmit from cave to surface by CW, but it does not transceive. Two-way communication is not essential for surveying operations, but it can be very useful. (People who don't know Morse code can usually *send* it intelligibly if provided with a code list and a few minutes of instruction on lengths of dots, dashes, spaces, letter and word spacing, and abbreviations.)

For a "downlink" I use a 12-volt-operated, 100-Watt police siren/PA amplifier driving either a large loop of wire lying on the surface or a pair of ground rods. A surplus 400-Hz variable autotransformer matches the amplifier to different loads. The underground voice receiver has a ferrite-core coil connected to an audio amplifier through a high-pass LC filter which cuts off at 600 Hz, with 70 dB of rejection below 300 Hz. The filter rejects the strongest power-line harmonics. A band of voice energy called the *first formant* is lost, resulting in loss of the qualities that distinguish individuals' voices, but intelligibility remains. The female voice works best here.

Magnetic Direction-Finding

Someone must take the transmitter into the cave to the point of interest and turn it on at an appointed time. The transmit coil must be horizontal and very accurately level.

Received signal strength depends on how much magnetic flux passes through the coil. With the plane of the coil parallel to the field, no

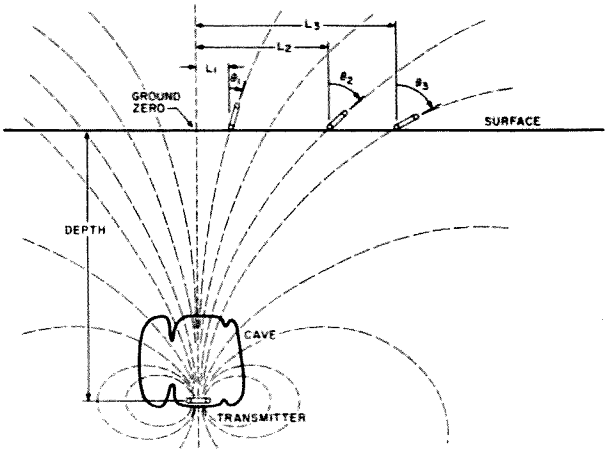


Fig. 7. Ground zero is pinpointed by finding the spot where the field is vertical. Then, distances (L) and vertical angles (Θ) are used in calculating depth of transmitter.

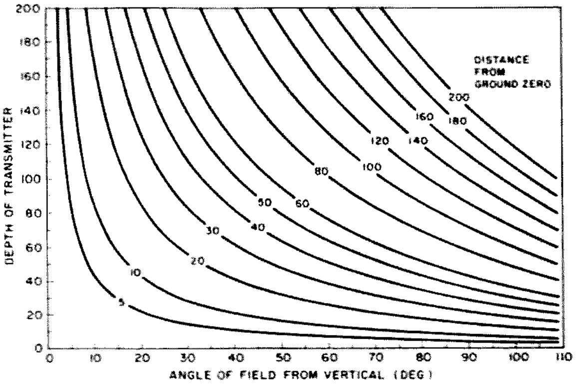


Fig. 8. Cave Radio Depth Chart (after W. Mixon). Each curve is depth vs. field angle for a different horizontal distance from ground zero. Use any distance units: feet, meters, etc. Example: For distance 50′ and angle 40°, depth is 102′. Thanks to Robert F. Blakely for providing this HP-85 computer plot.

CALCULATOR METHOD

Finding depth by calculator is fast, easy, eliminates plotting errors, and provides wider range than the graph. (The graph still has the advantages of low cost and easier error detection.) A programmable pocket calculator with nonvolatile memory, such as the Hewlett-Packard HP-29C, is ideal for calculating depth while on location.

HP-29C Program for Depth of Cave Radio

Equation solved for depth:

$$D = \frac{L(3 + \sqrt{9 + 8\tan^2 \Theta})}{4 \tan \Theta}$$

$0° < \Theta < 90°$

```
01  15 13 00   g LBL 0
02     15 34   g DEG
03     14 54   f TAN
04        31     ENTER
05     15 63   g x²
06        08     8
07        61     X
08        09     9
09        51     +
10     14 63   f √x
11        03     3
12        51     +
13        21     x≷y
14        04     4
15        61     X
16        71     ÷
17        61     X
18     15 12   g RTN
```

To use: Key in L.
ENTER
Key in Θ (in degrees).
GSB 0

Example: L = 50′, Θ = 45°: Depth = 89.04′

flux passes through the center and the signal disappears in a very sharp null (Fig. 5).

Viewed from above, the field of the transmit coil looks like straight lines radiating from the center (Fig. 6). The receiver operator can home in on the area of the underground transmitter by a technique similar to that of normal hidden-transmitter hunting: Hold the coil in a vertical plane and rotate to find the null direction, then "triangulate."

Once the approximate site has been found by horizontal nulls, the location can be refined to within a few inches, using vertical nulls. Fig. 7 shows a side view of the curved shape of the field. Point the coil toward maximum signal, then tilt it back and forth to find a null which indicates the direction of the field coming up out of the ground. Move in the direction of decreasing vertical angle to find a place where the null direction is straight down. Turn 90° horizontally and repeat the procedure, getting closer to the center of the field each time. "Ground zero" is the point where the vertical null is straight down, no matter what horizontal direction you point the coil's axis. An experienced operator can usually find ground zero in about ten minutes and determine depth in another ten.

Finding Depth

The receiver antenna should be mounted on a rigid, flat board or framework and must be equipped with some type of inclinometer, such as a carpenter's protractor. Estimate vertical angles to the nearest 1/10 degree when taking data for depth.

Mark ground zero with a stake or rock. Stretch a measuring tape horizontally away from ground zero and measure the vertical angle of the field at several different distances away. Use the distance-and-angle data in the calculator formula above or plot the data on the family of curves in Fig. 8. Average the results of several pairs of data. The depths should be consistent, falling near the average value and randomly either side of the average. An increasing or decreasing trend indicates an error in ground zero location or an unlevel transmit coil. Most of the error can be recovered by taking another set of data in the opposite direction away from ground zero and averaging the results of both sets.

Note that the slope of the depth function (Fig. 8) is very steep for small angles, i.e., a small error in measuring the angle will produce a large depth error. For best results, use only angles between 12° and 75°. (At vertical angles

near and greater than 90°, the null is less distinct and, of course, the signal is weaker at greater distances from ground zero.)

The depth chart (Fig. 8) derives from the formula: $\tan \theta = 3LD/(2D^2 - L^2)$, where: θ = angle of field (measured from vertical = 0°), L = horizontal distance from ground zero, and D = depth. The formula is an approximation which assumes that the transmit coil is very small relative to depth.

Note that the closed curves of the magnetic field are ellipses, not circles. Simple triangulation cannot be used to determine depth (D = L when θ = 71.57°, not 90°). An 8 1/2" × 11" working copy of the depth chart is available from the author for an SASE.

The Future

Extending the range of underground communication makes a fine project for hams, especially VLF enthusiasts. Experiments on 1750 meters should be especially interesting.

Correlation, signal-averaging, and other sophisticated techniques for weak-signal recovery are becoming increasingly attractive to amateurs with new developments in integrated circuits. Very-long-range cave radio could, of course, be accomplished by interfacing short-range cave-to-surface links with conventional amateur radio equipment. Future technology may allow communication through the entire Earth on modulated beams of neutrinos! ■

The National Speleological Society is an organization promoting safety and conservation in the sport and science of cave exploring. Their address is Cave Avenue, Huntsville, Alabama 35810.

See List of Advertisers on page 98

Tom Bowman WA3REY
4 Judy Drive, RD #3
Annville PA 17003

Bruce Long WA3PTU
c/o Ionospheric Research Lab
Room 224, EE East
University Park PA 16802

Here's the Split-Second Timer

In the darkroom or the shack, this beeper has 1001 uses. Its simplicity makes it the perfect beginner's project.

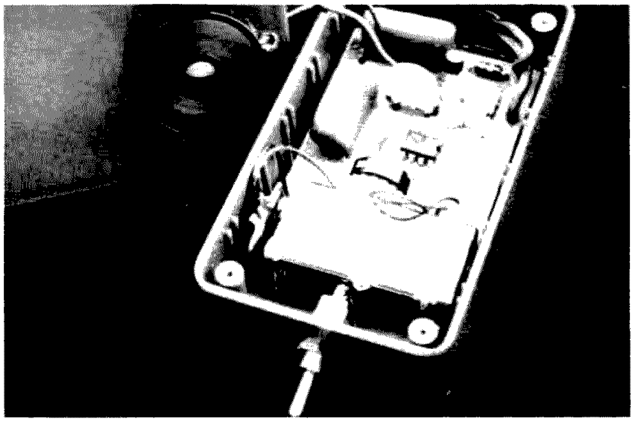
Editor's Note: This article, although not exclusively amateur radio oriented, so impressed us at *73* that we are presenting it here. The author has come up with a nifty audible clock circuit. The timer could be used in a photography darkroom, as suggested by the author, or in the ham shack to time your exposure of circuit boards. The timer is simple enough to build as a first-time project. We hope you enjoy this project as much as we did.

Like many hams that I've talked to, I have a second and maybe more expensive hobby—photography. Inflation has made my photo darkroom even darker with paper costs climbing to over 25 cents a sheet. Chemicals spiral upward along with paper prices while freelance jobs dwindle. The result is that I'm very money-conscious each time I open my bright yellow box of printing paper. I even scrawled "25¢ a sheet" on top of the box, but that didn't seem to cut back on the mountain of wasted paper.

Here's how to interface the beeper. A cube tap is pushed into the enlarger outlet of the mechanical darkroom timer. The red wire from the cube tap goes to my photo enlarger and the brown wire to the beeper. When the timer cycles line voltage to the enlarger outlet, both the beeper and the enlarger lamp come on together.

With rising paper costs in mind, I decided that the cure might be a new darkroom timer. Too many prints ended up in the wastebasket because of bad dodging and burning. What I needed was a timer that would help me be more accurate, print after print. But the new digital timers cost more than I was willing to spend.

My old mechanical timer worked fine as long as I left



Close-up detail of parts placement inside plastic case. The piezo buzzer is glued to the top of the case. The switch in the foreground is used to turn off the beeper while focusing under the enlarger.

it set on one particular time. The problem crept in when I needed to reset the timer to a new time to burn in part of the print. When I returned the pointer to the original time to make another print, that new print never looked the same as the first print.

Enter Bruce WA3PTU

I talked over my problem with Bruce Long WA3PTU. We reasoned that an audible beep sounding each second coupled to my present timer would permit me to set the timer for, say, 10 seconds and then never move it again. To add or subtract printing time would be easy. All I would have to do would be to count the seconds that ticked by, then block the enlarger's light path with my hand when the correct time was reached.

Dodging and burning prints could be done more accurately since I would hear the passing seconds as I worked over each print. All that was needed was an inexpensive add-on beeper (and, of course, the circuit from WA3PTU).

I built the beeper for about $11. The handful of parts came from the local Radio Shack store and fit into a plastic box. Calibration was simple using only my wristwatch. The beeper was interfaced with my darkroom timer by plugging it into a cube tap shared with my photo enlarger. The add-on beeper has made darkroom life more enjoyable and cost-efficient—so, let's build one.

How It Works

The beeper is simple. A piezo buzzer sounds each second that the enlarger lamp is on. Line voltage is also routed to the add-on beeper through a cube tap. That line voltage turns on a 2N2222 transistor switch in the beeper. The 2N2222 switches on the 555 timer circuit by grounding an internal 9-volt battery. When the mechanical darkroom timer shuts off the line voltage, the enlarger lamp and the beeper turn off, for practical purposes, simultaneously.

Part of the 555 timer circuit was borrowed from Don Lancaster's *TTL Cookbook*.[1] I won't repeat Lancaster's very complete description of why the circuit works. All that's necessary is to note that the combination of R1 and C1 produces a beep about .1 second long. The 5k pot adjusts the beep's volume.

The 500k pot calibrates the timing cycle. This pot is carefully adjusted until 61 beeps are timed in 60 seconds. That's right, 61 beeps. When the enlarger lamp and the beeper are first turned on, a beep sounds. That's the extra beep. I really wasn't sure that I could live with that first beep coinciding with the enlarger lamp turning on. Now, after 7 months of use, I expect that first beep and compensate for it. Look at it this way: When you have 20 identical prints to make of the family reunion, it doesn't matter if you remember 5 beeps or 6 beeps as the time for burning in Aunt Lydia's face. What counts is that you consistently give her face that same extra exposure on each of the 20 prints if you don't want to waste paper. Whether or not you count that extra first beep is your decision.

Building the Beeper

Now let's build the beeper. My beeper shown in the photos was built on a printed circuit board. However, a 2"×2" square of perfboard or an etched and drilled Radio Shack IC board, catalogue number 276-024, makes construction simple. The important thing is to make certain that you

[1] *TTL Cookbook*, Don Lancaster, Howard W. Sams and Co., p. 174.

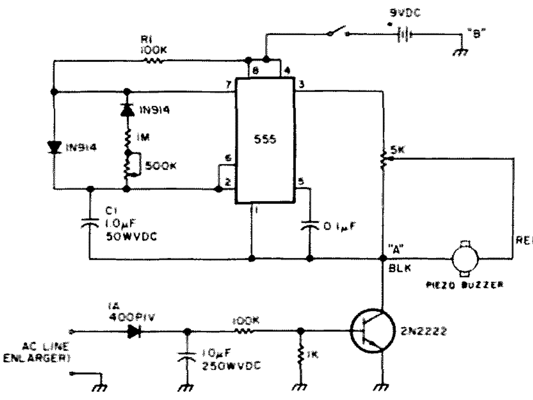


Fig. 1. Add-on beeper schematic.

assemble the parts in an *all plastic* box. That's a plastic box with a plastic panel. Do *not* substitute any of the multitude of boxes available with aluminum panels. The 110-volt-ac line is quite safe as long as it remains isolated inside the case. Aluminum panels could provide a dangerous path outside the box.

The circuit board and battery are friction-fit inside my case. Don't use metal screws to fasten the board to the box because of the shock hazard. Instead, glue the battery and board to the case with a few well-placed dabs of silicone rubber cement.

A word about parts. No, I don't manage a Radio Shack store or have stock in Tandy Corporation. The parts list has Radio Shack catalog numbers to help beginning builders. I'm certain that these commonly available parts can be found in most any ham junk box. Parts layout isn't critical, either. Observe the polarity of the piezo buzzer. The schematic is marked to show placement of the red and black leads.

Operation

I included a switch to turn off the beeper while focusing or composing under the enlarger. When you are ready to make that first print, turn on the beeper. Set the mechanical darkroom timer for your average printing time. I've standardized on 10 seconds. Never move the mechanical timer off the time you selected—in my case, 10 seconds. If you have a dense negative and must burn in parts of the print, simply press the mechanical timer's button again for another 10-second cycle and count off the extra time. You will probably find that the old mechanical timers are sufficiently accurate when used this way. Inaccuracies creep in when changing the time setting back and forth. For this reason it is much more accurate to set the timer and print as I described than it is to print for 10 seconds then reset the timer for another 5 seconds to burn in part of the print. Consistent dodging can be done by counting the beeps as you hold back underexposed parts of the negative.

Consistency and repeatability result from using the beeper and the "hands-off-the-timer" method. If you don't believe me now, wait until you finish that print order of 20 reunion pictures. Aunt Lydia will look the same on each print—guaranteed.

An Extra Added Bonus

Now that you've built the add-on beeper and love it, let's take it out of the darkroom. Remember that picture you tried to take last December of the Christmas tree and lights after dark in

Parts List

Quantity		Cat. No.	Price
1	Plastic box, 4" × 2-7/16" × 1-1/16" (Note: Box must be all plastic to isolate line voltage and prevent shock.)	270-221	$1.89
1	Piezo buzzer	273-060	2.99
2	Capacitors, 1 uF, 250 WV dc, mylar™ metal film	272-1055 ($.89 ea.)	1.78
1	Capacitor, .1 uF, 50 WV, disc	272-135	.79
1	Potentiometer, 500k	271-221	.59
1	Potentiometer, 5k	271-217	.59
2	Resistors, 100k, ¼ Watt, 5%	271-1347	.16
1	Resistor, 1k, ¼ Watt, 5%	271-1321	.08
1	Resistor, 1 meg, ¼ Watt, 5%	271-1356	.08
2	Diodes, silicon switching 1N914	276-1122	.20
1	Diode, 1 Amp, 400 piv	276-1103	.69
1	Timer IC, 555	276-1723	.99
1	Transistor, 2N2222	276-2009	.79
		Total	$11.62

Catalog numbers from 1982 Radio Shack Catalog No. 354.

the front yard? The Kodak *Professional Photoguide* suggests that with ASA 64 film and your camera lens set at f/8, a starting exposure is 5 seconds. Now, you could count "one-one-thousand, two-one-thousand . . ." or you could build a *second* add-on beeper to time that long exposure.

All you need is a PC cord to interface the beeper with your camera. Build another beeper *without* the ac line cord and transistor switching circuit. Cut off the end of the PC cord that mates with a flash unit and solder one PC cord wire to point A on the schematic and the other PC wire to point B. Plug the PC cord into the camera, set the shutter to Bulb, and hold open the shutter for an audible 5 seconds or 6 beeps.

Bracketing is just as easy as counting more or less beeps either side of the recommended starting exposure. Think you can count 5 seconds pretty accurately to yourself in your head? Well, the beeper might come in handy when making a picture of, let's see, a "moonlit snowscape." According to the *Professional Photoguide*, that's about 70 seconds at f/4, with Kodachrome 64 film.

Hmmm . . . Now if I want to bracket, that's 140 seconds and 35 seconds, but then I have to take into account reciprocity failure, so . . . Or was that 141 beeps and 36 beeps? Anyway, the important thing is to build a second beeper without line cord and interface it with your camera. That way there won't be any shock hazard.

The circuit is simple but the beeper works quite well. Build one and stop filling your darkroom wastebasket with printing paper. Instead, start thinking about where you're going to put that new tribander with all the money you save. ■

Bill Cikas
1627 Paradise Boulevard
Rockford IL 61103

Peak Your Picture With Home-Brew SSTV Test Gear

Go from gray scale to color bars with these simple generators. No monitor should be without them.

In my spare time I enjoy viewing slow-scan television on my home-brew monitor and like to keep up to date with advances in this field. Also, I enjoy designing with all types of integrated circuits, CMOS in particular. Thus, I have combined these two interests into the two projects described here. Each generator has nine ICs and few other components and both can be built for well under $100.

The SSTV gray-scale generator is used as a standard to adjust brightness and contrast levels on commercial slow-scan monitors and to peak sync and bandpass filters on home-brew equipment. It also can be used to check repairs or modifications on any monitor.

In addition to the above-mentioned operations, the SSTV color-bar generator is useful when selecting red, green, and blue filters for color slow-scan photography. It provides a pattern with these colors plus mixtures of them into blue-green, violet, yellow, and white.

Gray-Scale Generator

The MM5369 is a crystal-controlled oscillator providing a square wave at 3.58 MHz. This signal is divided by a factor of 10 through each of the 4017 dividers. A 35.8-kHz signal is present on pin 9 of the 4520 binary divider. A binary code is fed into the 4514 decoder.

Meanwhile, the 4069 clock provides a 240-Hz square wave to pin 1 of the other binary divider in the 4520 package. Here, the binary-coded output selects one of the 16 available input pins from the two 4051 digital selectors and passes reset information from the 4514 decoder through pin 3 of both 4051 ICs to the reset pin (pin 15) of the first binary divider.

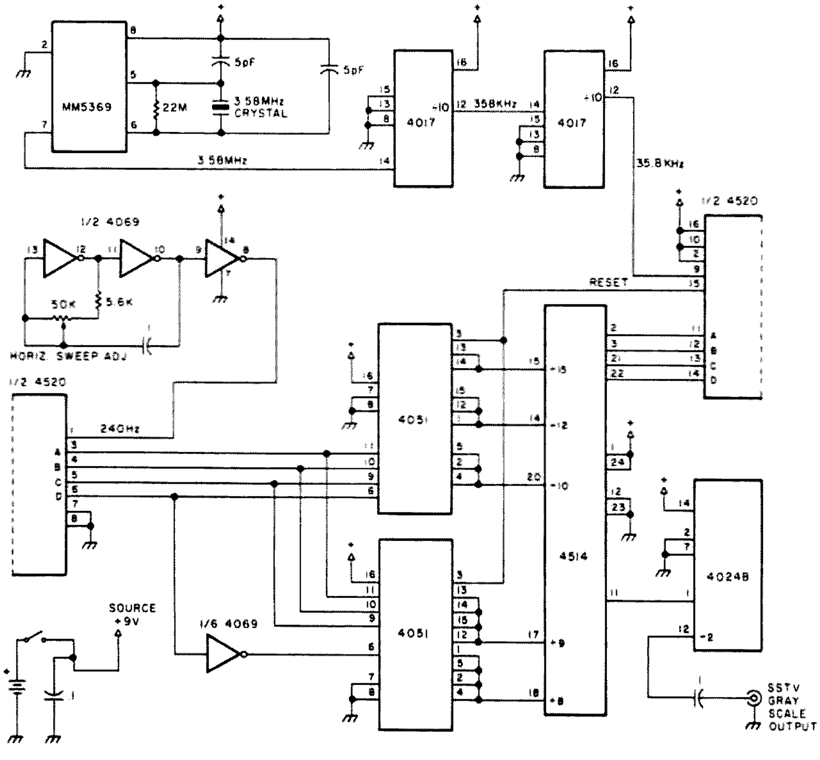


Fig. 1. CMOS SSTV gray-scale generator.

As the 16 input pins are swept through (top to bottom on the schematic), the 35.8-kHz frequency is divided by factors of 15, 12, 10, 9, and 8 respectively. This will constitute one scan line on the monitor. The 4024B takes frequencies from the "0" pin (pin 11) of the 4514 and divides all by a factor of two. The result is an SSTV gray scale with frequencies within one percent of 1200, 1500, 1800, 2000, and 2250 Hz. All are 50/50 duty-cycle square waves so gray-scale shades will result only from changes in frequency. The only adjustment necessary is horizontal sweep speed.

Color Bars for SSTV

The same general operation of the gray-scale generator can be redesigned to give us the three frame patterns necessary to produce, photographically, a slow-scan color-bar frame.

We start again with a 3.58-MHz oscillator and divide by a factor of 100, this time in a single 4518. A 35.8-kHz signal is fed to pin 9 of the 4520 and a binary-coded output is available at the address inputs of the 4514. Also, a clock frequency of 120 Hz is provided at pin 1 of the 4520 and a binary code is presented to a single 4051.

The action of the 4051 and the two sections of the 4053 can be described as switches in series. Binary data on address pins 9, 10, and 11 of the 4051 and control pins 9 and 10 of the 4053 will route data from the 4514 pins 15, 14, and 18 to pin 15 of the 4520. The timing of these connections will produce horizontal and vertical pulses as well as full cutoff and saturation (black and white) bars when viewed on the monitor. When looking at the three frame patterns, one can see a relationship forming between the width of the bars and the square-wave frequency at the RGB select switch.

A 555 timer is used as a 98/2 duty-cycle clock to control pin 10 of the 4053. This clock and the bottom 4053 switch provide a vertical sync option for the generator. For about two scan lines worth of time, the generator will produce a 1200-Hz tone. The monitor will look at this tone as a vertical sync pulse.

The 4013 is a divide-by-two stage that operates identically to the 4024B in the gray-scale generator. The output inverter is not necessary if one has a "B" series 4013 device.

Going Further

The heart of these audio-tone generators can be a good starting point for other projects. Add a memory (ROM) and send graphics or your call letters without a computer. Build a flying spot scanner, vidicon camera, or a totally solid-state SSTV camera with the new Reticon photodiode arrays (see *Radio Electronics*, March, 1982, page 75). ■

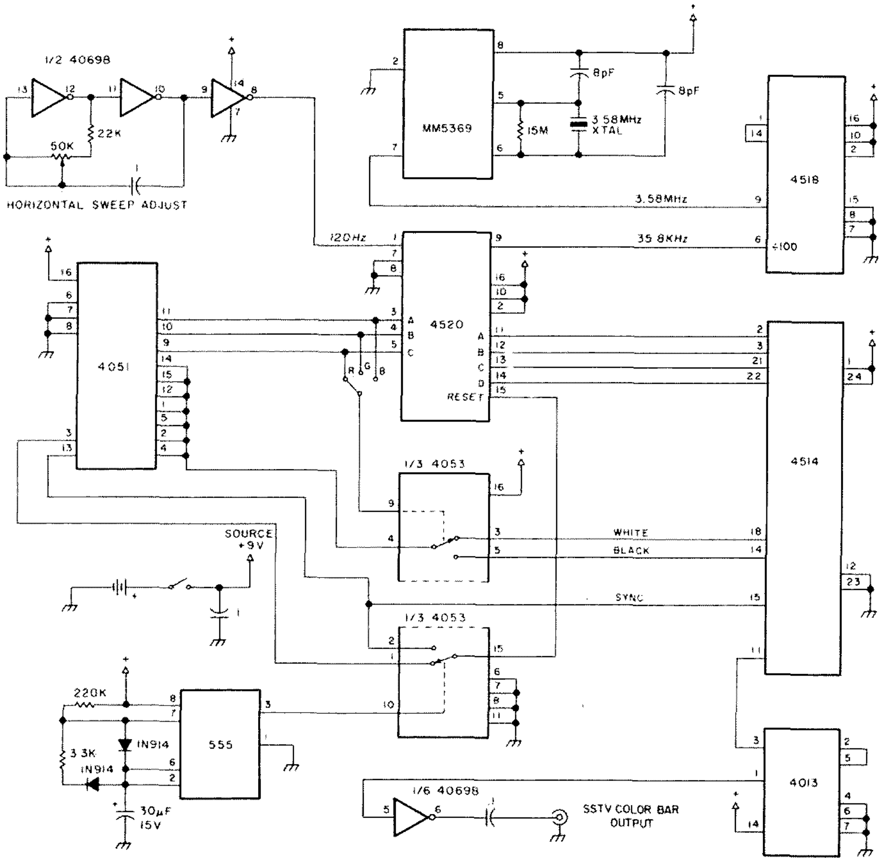


Fig. 2. CMOS SSTV color-bar generator.

✓ See List of Advertisers on page 98

Bob Myers KCØEW
729 Dawn Avenue
Ft. Collins CO 80524

Op Art

Include the ubiquitous op amp in your next circuit. KCØEW tells how.

When the Linear IC Hall of Fame is established, it's a pretty safe bet that among the first to be inducted will be the operational amplifier, or op amp. From the venerable 709 and 741 to the latest wideband wonders, this class of component has found its way into more circuits than practically any other chip.

The op-amp IC has made possible designs that would have been prohibitively expensive or complex just a couple of decades ago. You can filter with them. You can amplify with them. You can add, subtract, multiply, divide, integrate, buffer, mix, and oscillate with them. And if you can learn just a little bit about how to use these versatile gizmos, you'll find that design challenges that looked almost impossible can be simple—with some imaginative use of "Op Art."

Simply put, an operational amplifier is just a very high gain voltage amp with high input impedance and practically no output impedance. A typical op amp will show a voltage gain of several hundred thousand, with an input impedance in the megohms.

On a schematic they're not much to look at—Fig. 1 shows the ubiquitous triangle symbol of the op amp. The inputs are marked + and −, denoting the inverting and non-inverting inputs, respectively. The output is at the tip of the triangle.

The op amp is really a differential-input device, meaning that the output is an amplified version of the voltage *difference* between the two inputs; the + and − symbols merely give an indication of the polarity, or phase, of the output with respect to the input. Both inputs must be used for the output to do anything meaningful.

So we've got a part which will amplify a voltage by a hundred thousand times or more. Seems like just the thing for a stage with lots of gain, right? Just think, we'll feed the input a few millivolts (maybe from that turntable over there) and drive our speakers directly from the output!

Well, not quite. The op amp isn't meant to be a power amplifier, and that hundred-thousand gain simply isn't usable in this fashion. This gain figure, called the *open-loop* gain, is very important but not like this. The op amp, or any other single stage with this much gain, tends to be very unstable when run without something to keep it under control. That doesn't mean that all this gain is useless; we've just got to find the right way to apply it. The thing that makes the op amp's huge gain very desirable (and the key to most op amp applications) is the principle of *feedback*.

Feedback simply means that we're going to take a small portion of the output of a given stage (or series of stages) and return it to the input. Feedback can cause an otherwise stable circuit to suddenly go into violent oscillation—as anyone who's ever spent some time with PA systems knows! The squealing heard when a microphone is placed too close to the speaker it's driving is an example of *positive* feedback—the output signal is returned in-phase with the input, adding to it and driving the system farther and farther into oscillation. But if you return the output so that it is out of phase with the input, in *negative* feedback, you can actually improve the stability of the circuit. Here's how it works.

Consider the simple block diagram shown in Fig. 2. The triangle here is used to indicate some amplifier (not necessarily an op amp) with a voltage gain of A. This means that the output voltage is A times as big as the input voltage (V_{in}). V_{in} is applied to the amplifier so that it appears as the voltage *difference* between the two input leads, so we're still talking about a differential amplifier.

So far, no big deal, right? But suppose we add a block which returns a part of the output back to the input, as

EQUATIONS

1. $V_a = V_{in} - FV_{out}$
2. $V_{out} = AV_a$
3. $V_{out} = A(V_{in} - FV_{out})$
4. $V_{out} = V_{in}(A/1 + AF)$
5. $V_{out} = V_{in}(A/AF)$
6. $V_{out} = V_{in}(1/F)$
7. $V_{out} = V_{in}[1/(R1/(R1 + R2))]$
8. $V_{out} = V_{in}(1 + R2/R1)$
9. $V_{out} = -V_{in}(R2/R1)$
10. $V_{out} = -[V1(RF/R1) + V2(RF/R2) + V3(RF/R3) + \ldots]$
11. $V_{out} = (V1 - V2)(R2/R1)$

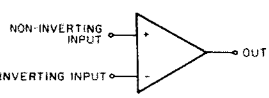


Fig. 1. The symbol for the op amp.

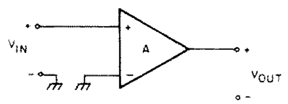


Fig. 2. An amplifier with a voltage gain of "A."

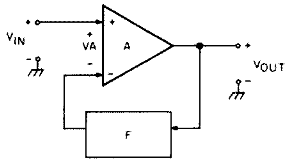


Fig. 3. An amplifier with feedback.

in Fig. 3. Here, the block marked F is doing just that. We'll use F as the gain of this block, saying that F times the output is fed back to the input. In Fig. 2, the output was just an amplified version (A times) of the input. But what's happening in this new arrangement?

Well, the output of the amplifier—the triangle stage—still has to be A times as big as the input. But the input to the amplifier is no longer just the input signal, V_{in}. The input to the amp—the voltage difference between the two input terminals—is now the difference between V_{in} and F times the output. If we call this signal V_a (for voltage at the amplifier), we can write Equation 1 (see box).

It is this combined signal that the amplifier block is working with, so the amplifier output (and the output of the whole thing, since they're the same) must be A times V_a (see Equation 2).

What we'd really like, though, is some relation between the original input signal (V_{in}) and the output. Well, Equation 1 gives us V_a in terms of both of these, so we can get rid of that pesky V_a just by plugging in the right side of 1 for V_a (see Equation 3).

This says that the output depends on both the input and itself. (Well, what did you expect with feedback?) A few more algebraic tricks: dividing both sides by V_{out} and rearranging gives us Equation 4.

This might not look all that impressive at first glance (heck, it might not look that impressive at *second* glance), but let's think a bit about what it means. Remember, A is the gain of

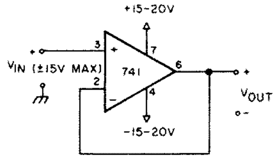


Fig. 4. A non-inverting buffer.

the triangle block in Fig. 3—the amplifier proper—and F is the gain of the feedback path around the amp. Since we know we're trying to find some use for a large gain amp, what happens if A in this equation becomes very large?

If A is a large number, then A times F must also be a large number, at least until F gets pretty small. And if A times F is large, then adding one to it shouldn't change it very much—I mean, 100,000 and 100,001 are pretty much the same, right? So in Equation 4, the 1 + (A × F) might just as well be simply A × F—the added one isn't going to make much difference one way or another. Well, if we drop the one we get Equation 5 which then, dividing through by A, results in Equation 6.

Now, *that's* something we can use. What this has all boiled down to is the fact that *if* our assumption about A × F being large is true, then the output does *not* depend on the actual gain of the amplifier at all! As long as the gain of the amplifier (A) is large enough to make A × F much bigger than one, the output of this whole gadget will depend only on the input and the gain of the feedback path, F. The gain of that path might actually turn out to be a loss; if F is one-fifth, then V_{out} will be five times the amplitude of V_{in} regardless of the actual gain of the op amp we use to build it!

What's actually happening here is that we're comparing a part of the output to the input and getting a signal (V_a) which is a measure of how far off the output is from the desired signal. V_a is an "error volt-

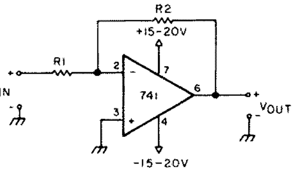


Fig. 5. An inverting amplifier.

age." If V_{out} were an exact copy of V_{in}, just five times bigger, and we compare V_{in} with one fifth of V_{out}, we would expect an error voltage of zero. This is how negative feedback controls the output of the stage.

As an example, look at Fig. 4. Here, F is one; all of the output is being fed back to the input. This says that the output will be an exact copy of the input. This circuit, called a *non-inverting buffer*, is useful for picking off a sample of a certain signal without loading down that signal's source—remember, the op amp has extremely high input impedance. If you'd rather get an inverted version of the signal, you can use the *inverting amplifier* circuit of Fig. 5, with R1 = R2. (Actually, Fig. 4 is a special case of the *non-inverting amplifier* shown in Fig. 6—it just has R2=0 and R1 infinite.)

Figs. 5 and 6 show how feedback is applied for the cases of inverting and non-inverting amps. Fig. 6, the non-inverting amp, is probably the easiest to understand: R2 and R1 form a voltage divider and the voltage across R1 is what is compared to the input. So, for this case, the F of our earlier equations is simply the voltage divider, and we can write Equation 7.

Equation 8, a rearranged Equation 7, is the usual way

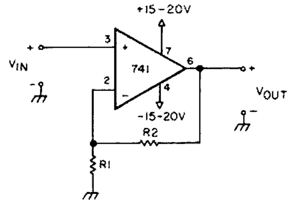


Fig. 6. A non-inverting amplifier.

of expressing the gain of this configuration. The inverting case is a bit more difficult to see since the feedback isn't in series with the input signal. But if you think of it in terms of current—the amount of current required through R2 to produce the same drop as a given amount through R1—then it looks like F will simply be the ratio of these resistances, and we get Equation 9. The minus sign shows up because this is an *inverting* amplifier—V_{out} is reversed from V_{in}. Notice that these circuits give us a quick and easy way to build voltage amplifiers with gains set simply by the proper selection of resistor values.

There are a couple of other things we can do with the inverting amp that you might be interested in. Since the gain is set by the ratio of the two resistors, we can use the circuit of Fig. 7 as a *mixer*. The output will be the sum of the input signals added in proportion to the ratio of their input resistor and the feedback resistor (see Equation 10). The input resistors might even be variable, as in Fig. 8, so that you can change the level of each signal simply by adjusting the proper potentiometer. This circuit could form the basis for an audio mixer for your home-brew PA system.

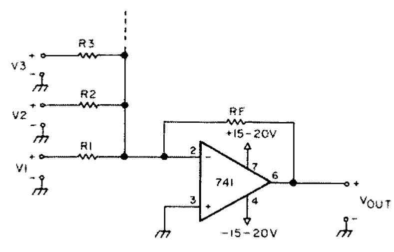


Fig. 7. An inverting amplifier used as a mixer.

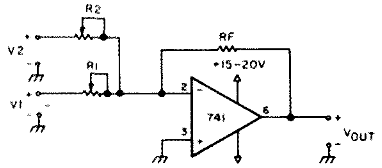


Fig. 8. Make the input resistors variable and you have the beginnings of an audio mixer.

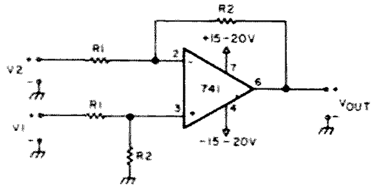


Fig. 9. A differential amplifier.

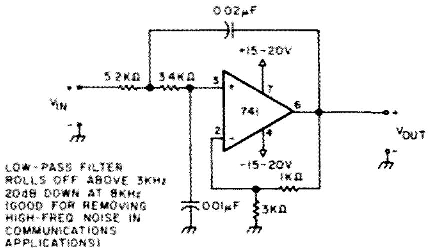


Fig. 10. A simple active filter.

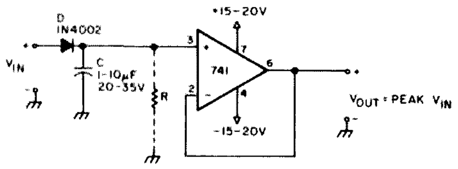


Fig. 11. A peak-detecting circuit.

Another interesting use for the op amp is the differential amplifier shown in Fig. 9. This circuit's output is related to the difference of the two input signals, V1 and V2. Note that the corresponding resistors on either side of the circuit are equal in value—R2A equals R2B, etc. The amplitude of the output is still set by the ratio of the resistances, and is expressed in equation II. This circuit can also be used for level shifting, if one of the inputs is fixed to a reference voltage.

But why limit ourselves to just resistances in the feedback loop? If we use some reactive components in this path (capacitors and inductors) we should be able to come up with a circuit whose output depends on the frequency of the input signal—in other words, a filter. Active filter design is a topic which can (and has) filled textbooks, but Fig. 10 shows a sample circuit to demonstrate the op amp's use in this area. Active filters turn out to be much simpler to design and build than their passive counterparts, due to the ease of isolating sections of the filter and the elimination of the need for inductors.

A couple of applications show some other uses of the op amp's characteristics. Fig. 11 is a *peak-detecting* circuit. Here, the capacitor charges to the peak voltage present at the input and stays there since it has no place to discharge. Remember, the input impedance of the op amp is very high, so it doesn't present much of a path for discharging the capacitor.

You should recognize the way the op amp is connected here—it's just the buffer from Fig. 4. One might place a resistor across the capacitor so that the cap will eventually discharge. The bigger the resistor, of course, the longer the cap will take to discharge and the closer the output will remain to the peak value. This circuit can be useful in tailoring meter responses, such as slowing down the response of some of the new bar-graph displays so that you can follow them more easily.

This should give you some idea of how to use the op amp for various jobs, and maybe already you can think of some applications for the circuits I've shown. There are, though, a few practical considerations to keep in mind.

First, the op amp usually will require both positive and negative supply voltages (though not always—see National Semiconductor's *Linear Databook* and *Linear Applications Handbook*). These supply voltages must not exceed the rating for the part you're using and will always limit the maximum amplitude allowed for the output. Make sure you're not asking for so much gain that you'd exceed this limit, or the output will clip at the maximum.

Also, while most modern op amps include some form of current limiting on the output, try not to use it. Keep your circuits running so that the op amp is running well within its maximum current-limit spec.

You should also be aware of the bandwidth and slew-rate limitations of the part you're using. *Slew rate*, usually expressed in something like volts per microsecond, is a measure of how fast the output voltage can change. This will determine how well the op amp can track signals at high frequency.

Compensation is another subject that often comes up for discussions of op-amp circuits. Here, I'm going to have to refer you to the manufacturer's data sheet for the op amp you're using. Some parts are *internally compensated*, while others will require that some external components (usually a resistor and capacitor in series) be added for compensation. All compensation means is that the frequency response of the amplifier is being adjusted to ensure that it will operate properly over the desired frequency range. This can be tailored to suit the application, but for now you're safest sticking with the recommended compensation for the part you're using. The 709, for example, wants around 2000 pF and 1.5k Ohms in series across its compensation leads; the 741 is internally compensated and needs no external components.

As with most ICs, supply bypassing is always a good idea—and don't forget you've got *two* supplies to worry about. A ceramic capacitor from each supply lead to ground, say around 0.1 uF, should be about right. You might want to add more, maybe a 10- or 20-uF tantalum if you're a good distance from the filter caps in your power supply or if you run into noise or oscillation problems.

The applications for the operational amplifier are practically innumerable—so go right ahead and see what you can do with your own version of Op Art. ■

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Linear Databook **(1978) and *Linear Applications Handbook* (1978), National Semiconductor Corp.**

Analysis and Design of Analog Integrated Circuits**, Paul R. Gray and Robert G. Meyer, 1977, John Wiley and Sons, Inc.**

Eugene Morgan WB7RLX
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Ogden UT 84404

Put the DX World on a Screen

Everything you need to know about a country can be at your fingertips. All you need is a VIC-20 and this program.

How many times have you been sitting at your receiver listening to the DX come in when you suddenly heard a prefix that you couldn't identify at all? Well, if you own a VIC-20 with at least an 8K expansion cartridge or an Apple II Plus, your worries are over. With this program, all you have to do after loading it is enter the prefix at the keyboard and a variety of pieces of helpful information will appear on your screen.

Immediately available to you will be the name of the country, its latitude and longitude, prefix, antenna bearings, and distance in miles and kilometers. At the touch of another key, the computer will check for any other country listed by the same prefix. If you still are unsure of the location of the country, the computer can indicate which countries border the one in question.

In the Apple program, many of the major cities in the United States and around the world are included in the data so that you can determine exactly how far it is to New York, Denver, Colorado, or even Paris, France. In the program for the unexpanded VIC, only major US cities have been included in the data. A useful feature of this program is that the user can customize it for individual needs. If you are a VHF enthusiast, you can enter cities located within your listening radius.

Adaptability

The locator program can be adapted to almost any size of memory from the VIC-20's small 3.5K to the Apple II Plus with its 48K. I have found that in order to get all the prefixes in the world excepting the US, one needs at least 11773 bytes, or 12K of memory.

With this program, bearings and distances can be figured by the latitude and longitude on the keyboard. In this mode, the computer can perform a search and identify the countries located around your coordinates. Another feature of this program is that if you enter the name of a country or island on the keyboard, the computer can tell you where the country is, its prefix, antenna bearing, and distance. At the touch of a key, the country's alternative prefix is provided, if it has one.

Program Run

After loading the program, type in the RUN command. At this time you will be presented with the following main menu with four selections: (1) Country or City, (2) Prefix, (3) Latitude and Longitude, and (4) Quit.

For our first example, let's take selection (1). Keystrokes: 1<RET>. Now you will be asked to enter the name of a country or city. Enter the name of the country in question. For our purpose, enter ITALY. Keystrokes: ITALY <RET>. The screen will clear. Then the flashing prompt SEARCHING DATA will appear. If the information is not found, the screen will clear, a prompt will say END OF DATA, and the program will return you to the main menu. If the data is found, the screen will clear and the information will appear.

First will be the name of the country. Next will be the latitude and longitude, followed by the prefix, antenna bearings, and the distance in miles or kilometers. At the bottom of your screen will be the prompt (F7)=SEARCH DATA OR HIT ANY KEY. If you press any key, you will return to the main menu. If you press the F7 key, the computer will search for any other listings for the country entered. If there are none, the program will return to the main menu. If there is another prefix, the alternative prefix and the country's data will be provided.

Now let's go back to the main menu again. Let's pick the second selection. Keystrokes: 2<RET>. You will now be asked for a prefix. For our example, let's use TT. Keystrokes: TT<RET>. Again the screen will go blank and the prompt SEARCHING DATA will appear. When the data is found, the prompt will stop flashing, the screen will clear, and the information for the Republic of Chad will appear. If you press the

F7 key, the computer will search for any other countries listed by the prefix TT. Finding none, the computer will return to the main menu.

For the third selection, keystroke 3<RET>. The screen will clear and then a prompt will appear asking for latitude. If it is a north latitude, enter the number as a positive number. If it is a south latitude, enter it as a negative number. For example, let's use negative 45 degrees. Keystrokes: −45 <RET>. If you enter a number larger than 90 or less than negative 90, you will get an error message and be asked for the information again. The program, as we say in computer language, will not crash.

After you have entered the latitude and pressed the Return key, another prompt will appear requesting the longitude. Enter east longitude as a positive number and west longitude as a negative number. For our example, enter a positive 120 degrees. Keystrokes: 120<RET>. The computer will not accept any number larger than a positive 180 or less than a negative 180. A prompt will appear to ask you if your data is correct. Enter either a 1 for Yes or 2 for No. If you type a 2, the program will ask you for the correct latitude and longitude.

Our data is correct so you can press 1. The screen will display the latitude and longitude, the antenna bearings, and the distance in miles to the coordinates you have entered. At the bottom of the screen you will find the prompt (F7)=SEARCH DATA OR HIT ANY KEY. Any key will return you to the main menu. If you press the F7 key, this screen will first clear and this prompt will appear: I WILL SEARCH MY FILE FOR DATA ON LOCATION NEAR YOUR COORDINATES. HOW WIDE OF SEARCH IN DEGREES? You can enter any number between 1 and 360. Let's enter 20. Keystrokes: 20<RET>. The computer will go through its data file and locate any coordinates within 20 degrees of the search area. If the computer finds any country around the entered coordinates, it will stop the search and print the data on the screen. If you press the F7 key again, it will continue the data search for another country around your coordinates. When the program comes to the end of the data file, the screen will clear and the prompt END OF DATA will appear and return you to the main menu.

The last selection on our menu is number 4. I do not think this needs any explanation.

Now that we have been through the programs, let me point out a few things. First, when entering a city or country name, it must be spelled correctly. If the country in question is an island, it needs to be entered as such, e.g., CAICOS IS. Secondly, when entering south, north, east, or west, there should be no space between the abbreviation, the period, and the name, e.g., W.SAMOA. Whenever the word Saint is used, it should be abbreviated as ST, e.g., ST. VINCENT IS. This is done to conserve as much memory for data statements as possible.

I chose Basic for the program because of the language adaptability, and this makes it easy for the user to customize the program for special needs. A big gun DXer may want prefixes from around the world while the net operator may want only cities across the nation.

The program design is as simple as I could make it to accommodate a lack of memory. Rewriting the program for the Sinclair, Atari, or the TRS computers should not be difficult. As you look through the listing, you will notice a few special characters. These generally concern the screen display. For a definition of some of the VIC special characters, refer to the sample run accompanying this article.

For a look at how the program works, start at line 10. Line 10 is where the main menu is printed. Line 24 is a very important line. This is where the user puts his information concerning his location. CLR will clear all variables. RESTORE returns the data pointer to the start of the data statements. The variable A is the latitude of the user's QTH. L1 is the variable for the user's longitude and SP$ is the name of the user's city and state. Line 25 is the input line for your selection from the main menu and line 26 sends the program on its way.

Line 50 is the start of the routine for entering the name of the city or country. C$ is the name of the country we are looking for. Line 55 is the gosub that sends the program to the read statement and a line of data is then read. After the data is read and the variables Z$ prefix, L$ name of the city or country, B latitude, and L2 longitude are filled in, then the program compares the L$ and the C$. If the L$ and C$ are the same, the program goes to subroutine 500 and then to line 200, the display routine. If the variables are different, the computer reads another line of data.

Line 57 checks to see if all data has been looked at. If it has, the program goes to line 250 and does an end-of-data routine. Lines 60 through 64 work the same as lines 50 through 58 except that the variables H$ and Z$ are compared for a match.

Lines 70 through 84 are the routine for entering the latitude and the longitude. Lines 85 through 110 are the area where I put the gosubs. Line 85 is the error message for whenever the user inputs data the computer cannot use. Line 100 is the flashing SEARCHING DATA prompt and the read statement. Line 110 is a delay loop.

Lines 200 through 227 contain the routine which displays the information after it has been processed by the math subroutine located on lines 500 through 900. Line 200 prints the value of L$, the name of the state or country. Line 201 prints the latitude, B. Line 202 prints the longitude, L2, and line 205 prints the prefix, Z$. Line 210 prints antenna bearings, R2, derived from the math routine. Line 215 prints the name of the starting point, home QTH, and the distance in miles from SP$. Line 220 prints the distance in kilometers from SP$. Line 224 prints the prompt at the end of the display, (F7)=SEARCH DATA OR HIT ANY KEY.

At this prompt, the program waits for you to press a key. If you press the function key, F7, the program will go into the search routine depending on what selection you choose from the main menu. Lines 227 through 230 take care of this function. If you press any other key, the program will return to the main menu, line 232.

Lines 235 through 244 are the search routine used for main menu selection number 3, the latitude and longitude. Line 239 checks for the end of data. Lines 240 through 243 filter the value of the latitude and longitude read in the data statement. If all conditions are met, the value of the variables is filled from the math routine (lines 500 through 900) and forwarded to the display routine. Line 250 is the executed line whenever the data read statement reaches the end of the data (line 3000).

Math Routine

The math routine was derived from two sources, the *ARRL Antenna Handbook* and a math routine used in a program published in *The Giant Book of Computer Software* (1st Ed., pp. 264-265). I made a lot of changes in order to save memory, but basically it works the same. The math routine is

```
1 PRINT"]■■■■■■LOCATOP PROGRAM (C)82":PRINT"BY E. MORGAN":GOSUB110
10 PRINT"]    **MAIN MENU**":PRINT"■■HOW DO YOU WANT ME TO LOCATE DATA?"
15 PRINT"■■1..COUNTRY OR CITY":PRINT"■2..PPEFIX":PRINT"■3..LAT.& LONG.":PRINT"■4
..QUIT"
24 CLR:RESTORE:A=41.14:L1=-111.58:SP$="OGDEN, UTAH"
25 PRINT"■":INPUTE
26 ONEGOTO50,60,70
31 IFE=4THENPRINT"]":END
35 GOTO25
50 PRINT"]■■ENTER COUNTRY OR CITY.":INPUTC$:IFC$="£"THEN10
55 GOSUB100
56 IFL$=C$THENGOSUB500:GOTO200
57 IFZ$="END"THEN250
58 GOTO55
60 PRINT"]ENTER PREFIX":INPUTH$:IFH$="£"THEN10
61 GOSUB100
62 IFZ$=H$THENGOSUB500:GOTO200
63 IFZ$="END"THEN250
64 GOTO61
70 PRINT"]LATITUDE?":INPUTB:IFB>90ORB<-90THENGOSUB85:GOTO70
77 PRINT"■LONGITUDE?":INPUTL2:IFL2>180ORL2<-180THENGOSUB85:GOTO77
78 PRINT"■IS YOUR INPUT CORRECT":PRINT"1=YES 2=NO":INPUTW
79 ONWGOTO84,70
84 PRINT"]":GOSUB500:GOTO201
85 PRINT"]ERROR":GOSUB110:RETURN
100 PRINT"]■■■■■■■   SEARCHING DATA!":READZ$,L$,B,L2:RETURN
110 FORT=1TO3000:NEXT:RETURN
200 PRINT"]■"L$"■"
201 PRINT"■LATITUDE   "B
202 PRINT"LONGITUDE  "L2
205 PRINT"■PREFIX:"Z$
210 PRINT"■BEARING:"R2
215 PRINT"■■DISTANCE FROM ":PRINTSP$"■":PRINTD1" MILES"
220 PRINT"■"D2" KILOMETERS"
224 PRINT"■■■(F7)=SEARCH DATA OR     HIT ANY KEY."
226 GETS$:IFS$=""THEN226
227 PRINT"]":IFS$=CHR$(136)ANDE=3THEN235
228 IFS$=CHR$(136)ANDE=2THEN61
229 IFS$=CHR$(136)ANDE=1THEN55
230 IFS$=CHR$(136)ANDE=0THEN238
232 GOTO10
235 PRINT"]I WILL SEARCH MY FILE FOR DATA ON LOCATION  NEAR YOUR CORDINATE."
236 PRINT"■HOW WIDE OF SEARCH IN DEGREES?":INPUTG%
237 ZB=B:ZL=L2
238 GOSUB100
239 IFZ$="END"THEN250
240 IFB>ZB+Q%THEN238
241 IFB<ZB-Q%THEN238
242 IFL2>ZL+Q%THEN238
243 IFL2<ZL-Q%THEN238
244 E=0:GOSUB500:GOTO200
250 PRINT"]■    END OF DATA!":GOSUB110:GOTO10
500 A1=A*π/180:L=L2-L1:X=0
510 IFL<-180THEN525
515 IFL>180THEN535
520 GOTO540
525 L=L+360:GOTO610
535 L=L-360
540 IFL<0THEN610
545 X=1
610 B1=B*π/180:L=L*π/180:P=COS(L)*COS(A1)*COS(B1)+SIN(A1)*SIN(B1)
625 P1=ATN(SQR(1-P*P)/P):P2=P1*180/π
635 IFP2<0GOTO645
640 GOTO650
645 P2=P2+180
650 D1=INT(P2*60*1.15152+.5):D2=INT(D1*1.6093+.5)
655 R=COS(B1)*SIN(L)/SIN(P1):R1=ATN(R/SQR(1-R*R)):R2=INT((R1*180/π)+.5)
670 IFABS(R)>.99999THEN800
675 IFABS(R)<.00174THEN850
680 B2=(B+.1)*π/180:R3=COS(L)*COS(A1)*COS(B2)+SIN(B2)*SIN(A1)
690 R4=ATN(SQR(1-R3*R3)/R3):R6=COS(B2)*SIN(L)/SIN(R4)
705 IFX=1THEN740
710 IFABS(R6)>ABS(R)THEN730
715 R2=360-ABS(R2):GOTO900
730 R2=180+ABS(R2):GOTO900
740 IFABS(R6)<ABS(R)THEN755
745 R2=180-ABS(R2):GOTO900
755 R2=ABS(R2):GOTO900
800 IFX=1THEN830
810 R2=270:GOTO900
830 R2=90:GOTO900
850 IFABS(L)>178THEN870
855 IFB<ATHEN865
860 R2=0:GOTO900
865 R2=180:GOTO900
870 IFB>ATHEN865
875 GOTO860
900 RETURN
1000 DATAAC4,SIKKIM,32,83,AP,PAKISTAN,31,88,A2,BOTSWANA,-22,24,ZS9,BOTSWANA,-22,
24
1001 DATAA35,TONGA,-21,-175,A4,OMAN,20,58,A5,BHUTAN,27,90,AC5,BHUTAN,27,90
1002 DATAA6,UNITED ARAB EMIRATES,24,54,A7,QATAR,25,51,A9X,BAHRAIN,26,50
1003 DATAA9X,BAHAIN,26,50,BV,TAIWAN,23,121,BY,CHINA,35,105,CE,CHILE,-30,-71
1004 DATACE0A,EASTER IS.,-21,-177,CE0X,SAN FELIX IS.,-26,-80
1005 DATACE0Z,JUAN FERANDEZ IS.,-33,-79,CM,CUBA,21,-80,CO,CUBA,21,-79
1006 DATACN,MOROCCO,32,-5,CP,BOLIVIA,-15,-65,CR3,GUINEA BISSAU,12,-15
1007 DATAJ5,GUINEA BISSAU,12,-15,CR5,PRINCIPE IS.,1,7,S9,PRINCIPE IS.,1,7
1008 DATACR5,SAO TOME IS.,12,6,S9,SAO TOME IS.,12,6,CR8,TIMOR IS.,-10,125
1009 DATACR9,MACAO,22,113,CT1,PORTUGAL,39,-8,CT2,AZORES IS.,38,-28
1010 DATACT3,MADEIRA IS.,32,-16.5,CX,URUGUAY,-33,-56,C2,NAURA IS.,-.3,166.5
1011 DATAVK9,NAURA IS.,-.3,166.5,C3,ANDORRA IS.,42,1,FX,ANDORRA IS.,42,1
1012 DATAC5,GAMBIA,13,-15,ZD3,GAMBIA,13,-15,C6,BAHAMA IS.,25,-75
1013 DATAVP7,BAHAMA IS.,25,-75,C9,MOZAMBIQUE,-18,35,CR7,MOZAMBIQUE,-18,35
1014 DATAD,W.GERMANY,51,9,DM,E.GERMANY,52,12,Y2-Y9,E.GERMANY,52,12
1015 DATADU,PHILLIPPINES,12,125,DX,PHILLIPPINES,12,125,D2,ANGOLA,-12,18
1016 DATAD3,ANGOLA,-12,18,D4,CAPE VERDE,16,-24,EA,SPAIN,40,-4
1018 DATAEA9,MELILLA,35,-2,EI,IRELAND,53,-8,EL,LIBERIA,6,9,EP,IRAN,33,55
1019 DATAET,ETHIOPIA,9,39,F,FRANCE,46,2,FB8W,CROZET IS.,-46,53,FB8X,KERGUELEN IS
.,-49,69
1020 DATAFB8Z,ST.PAUL & AMSTERDAM IS.,-38,73,FC,CORSIA,42,9,FG7,GUADELOUPE,16,-6
1
1021 DATAFH,MAYOTTE IS.,-12.5,45,D6,COMORO IS.,-12,44,FK8,NEW CALEDONIA,-21,165
1022 DATAFL8,DJIBOUTI,11,43,J2,DJIBOUTI,11,43,FM7,MARTINQUE,14.4,-61
1023 DATAFO8,FRENCH POLYNESIA,-18,-149,FO8,CLIPPERTON IS.,10,-109
1024 DATAFP8,ST.PIERRE IS.,46.5,-56,FP8,MIQUELON IS.,47,-56,FR,REUNION IS,-21,55
1025 DATAFR,GLORIOSO IS.,-9,51,FR,JUAN DE NOVA IS.,-17,42.5,FR,TROMELIN IS.,-15.
5,54
1026 DATAFS,ST,MARTIN IS.,18,63,FG,ST,MARTIN IS.,18,63,FW8,WALLIS & FUTUNA IS.,-
14,-177
1027 DATAFY7,FRENCH GUIANA,4,-51,G,ENGLAND,52,-1,GD,ISLE OF MAN,54,-4
1028 DATAGI,N.IRELAND,55,-8,GJ,JERSEY IS.,49,-2,GC,JERSEY IS.,49,-2,GM,SCOTLAND,
57,-4
1029 DATAGU,GUERNSEY IS.,49,-2,GC,GUERNSEY IS.,49,-2,GW,WALES,52,-3
1030 DATAHA,HUNGARY,47,20,HG,HUNGARY,47,20,HB,SWITZERLAND,47,8,HE,LIECHENSTEIN,4
7,9,4
1031 DATAHB0,LIECHENSTEIN,47,9.4,HC,ECUADOR,0,-78,HC8,GALAPAGOS IS.,-.3,-90.3
1032 DATAHH,HAITI,19,-72.5,HI,DOMINICAN REP.,19,-70,HK,COLOMBIA,5,-75,HM,KOREA,3
7,127
1033 DATAHK0,PROVIDENCIA IS.,-9,51,HK0,MALPELO IS.,3.6,-81.4,HL,KOREA,37,127
1034 DATAHK0,SERRANE BANK & RONCADOR CAY,14,-80,KP3,SERRANE BANK & RONCADOR CAY,
14,-80
1035 DATAKS4,SERRANE BANK & RONCADOR CAY,14,-80,HK0,SAN ANDRES IS.,13,-83
1036 DATAHP,PANAMA,9,-80,HR,HONDURAS IS.,15,-86,HR,SWAN IS.,44,-68.2,HS,THAILAND
,15,100
1037 DATAHV,VATICAN CITY,41.54,12.27,HZ,SAUDIA ARABIA,25,45,7Z,SAUDIA ARABIA,25,
45
1038 DATAI,ITALY,42,12,IT,SICILY,37,14,IS,SARDINIA,40,9,IM,SARDINIA,40,9
1039 DATAJA-JN,JAPAN,35,139,JD,OGASAWAPA IS.,28,142,KA1,OGASAWAPA IS.,35.5,139.5
1040 DATAJD,MINAMI-TORI-SHIMA IS.,24,154,KA1,MINAMI-TORI-SHIMA IS.,24,154
1041 DATAJT,MONGOLIA,46,100,JW,SVALBARD IS.,78.5,16,LA,SVALBARD IS.,78.5,16
1042 DATALP,SVALBARD IS.,78.5,16,JX,JAN MAYEN IS.,72,-9,LA,JAN MAYEN IS.,72,-9
1043 DATALP,JAN MAYEN IS.,72,-9,JY,JORDON,31,36,KB,BAKER IS.,.1,178,KH1,BAKER IS
.,.1,178
1045 DATAKB,HOWLAND IS.,1,-178,KH1,HOWLAND IS.,1,-178,KC4,NAVASSA IS.,19,-75
1046 DATAKP1,NAVASSA IS.,19,-75,KC6,CAROLINE IS.,8,140,KG4,GUANTANAMO BAY,20.1,-
75.1
1047 DATAKG6,MARIANA IS.,15,145,KH0,MARIANA IS.,15,145,KG6,GUAM IS.,13,144.5
1048 DATAKH2,GUAM IS.,13,144.5,KH6,HAWAII IS.,20,-157.5,KH7,KURE IS.,27,-178
1049 DATAKJ6,JOHNSTON IS.,17,-169,KH3,JOHNSTON IS.,17,-169
1050 DATAKM6,MIDWAY IS.,28,-177,KH4,MIDWAY IS.,28,-177,KP4,PUERTO RICO,18,-66.5
1051 DATAKP6,KINGMAN REEF,7,-163,KH5,KINGMAN REEF,7,-163,KP6,JARVIS IS.,-.4,-160
1052 DATAKP6,PALMYRA IS.,6,-163,KS6,AMER.SAMOA,-14,-170.5,KH8,AMER.SAMOA,-14,-17
0.5
1053 DATAKV4,VIRGIN IS.,17.4,-65,KW6,WAKE IS.,19,166.4,LA,NORWAY,62,10
1054 DATAKH9,WAKE IS.,19,166.4,KX6,MARSHALL IS.,10,170,LB,NORWWAY,62,10
1055 DATALF,NORWAY,62,10,LG,NORWAY,62,10,LJ,NORWAY,62,10,LU,ARGENTINA,-40,-65
1056 DATALX,LUXEMBOURG,49.5,6,LZ,BULGARIA,43,25,M1,SAN MARINO,43.6,12.3
1057 DATAOH,FINLAND,64,26,OF,FINLAND,64,26,OH0,ALAND IS.,60.1,20,OJ0,MARKET REEF
,64,21
1058 DATAOK,CZECHOSLOVAKIA,50,19,ON,BELGIUM,50,4,OX,GREENLAND,70,-40
1059 XP,GREENLAND,70,-40,OY,FAEROES IS.,62,-7,OZ,DENMARK,56,10,PA,NETHERLANDS,52
,5
1060 DATAPD,NETHERLANDS,52,5,PE,NETHERLANDS,52,5,FI,NETHERLANDS,52,5
1061 DATAPJ,NETHERLANDS ANTILLES IS.,12,-69,PJ,ST.EUSTATIUS,12,-69,PJ,SABA IS.,1
2,-7
1062 DATAKP2,VIRGIN IS.,17.4,-65,PJ,ST.MAARTEN IS.,12,-69,PY,BRAZIL,-10,-50
1063 DATAPY0,TRINDADE &MARTIM IS.,-20.3,-29,PY0,ST.PETERS & ST.PAULS ROCK,2,29.5
1064 DATAPY0,FERNANDO DE NORANHA IS.,-3.5,32,PZ,SURINAM,5,-55,P2,NEW GUINEA,-7,1
44
1065 DATASK,SWEDEN,62,15,SL,SWEDEN,62,15,SM,SWEDEN,62,15,SP,POLAND,52,19,3Z,POLA
ND,52,19
1066 DATAST,SUDAN,15,30,SU,EGYPT,27,30,SV,GREECE,39,22,SV,GRETE,35,24.5
1067 DATASV,DODGECANESE IS.,36.6,26,S2,BANGLADESH,24,90,TA,TURKEY,39,35
1068 DATATF,ICELAND,65,-18,TG,GUATAMALA,15,-90,TI,COSTA RICA,10,-85,TI9,COCOS IS
.,5,-87
1069 DATATJ,CAMEROON,6,12,TL,CENTRAL AFRICAN REP.,7,21,TN,CONGO,-1,15,TR,GABON,-
1,11.5
1070 DATATT,CHAD,15,19,TU,IVORY COAST,8,-5,TY,BENIN,9,2,TZ,MALI,17,-4,UA,U.S.S.R
.,55,80
1071 DATAUK,U.S.S.R.,55,80,UT,U.S.S.R.,55,80,UB,U.S.S.R.,55,80,UY,U.S.S.R.,55,80
1072 DATAVE,CANADA,60,-95,VY,CANADA,60,-95,VK,AUSTRALIA,-25,130
1073 DATAAX,AUSTRALIA,-25,130,VK2,LORD HOWE IS.,-31.3,159,VK9,NORFOLK IS.,-29,16
7.6
1074 DATAVK9,CHRISTMAS IS.,-10,105,VK9,COCOS IS.,-12.5,97,VK9,MELLISH REEF.,-17.
2,155.
1075 DATAVK0,HEARD IS.,-63,74,VK0,MACQUARIE IS.,-63,74,VK0,MCDONALD IS.,-54,74
1076 DATAVO1,NEW FOUNDLAND,52,-56,VO2,LABRADOR,54,-62,V3,BELISE,17,-88,J3,GRENAD
A,12,-61.4
1077 DATAV2,ANTIGUA & BARBUDA,17,-61.5,VP2A,ANTIGUA 6 BARBUDA,17,-61.5
1078 DATAJ7,DOMINICA IS.,15,-61,VP2D,DOMINICA IS.,15,-61,VP2E,ANGUILLA IS.,18,-6
3
1079 DATAVP2K,ST.KITTS & NEVIS IS.,17,-64.5,VP2L,ST.LUCIA IS.,15.5,-61
1080 DATAJ6,ST.LUCIA IS.,15.5,-61,VP2M,MONTSERRAT IS.,16.5,-62.1,J8,ST.VINCENT I
S.,13,-61
1081 DATAVP2S,ST.VINCENT IS.,13,-61,VP2V,BRITISH VIRGIN IS.,18,-64,VP5,TRUK IS.,
21.5,-71
1082 DATAVP5,CAICOS IS.,21.5,-71,VP8,FALKLAND IS.,-51,-60,LU,FALKLAND IS.,-51,-6
0
1083 DATAVP8,S.GEORGIA IS.,-54,-36.5,LU-LZ,S.GEORGIA IS.,-54,-36.5
1084 DATAVP8,S.ORKNEY IS.,-61,-45,LU-LZ,S.ORKNEY IS.,-61,-45
1085 DATAVP8 S.SANDWICH IS.,-58,-38,LU-LZ,S.SANDWICH IS.,-58,-38
1086 DATAVP8,S.SHETLAND IS.,-65,-65,LU-LZ,S.SHETLAND IS.,-65,-65,VP9,BERMUDA IS.
,32,-64
1087 DATAVQ9,CHAGOS IS.,-8,73,VQ9,SEYCHELLES IS.,-4,55,S7,SEYCHELLES IS.,-4,55
1088 DATAVR1,GILBERT & OCEAN IS.,-.5,169,T30,GILBERT & OCEAN IS.,-.5,169
1089 DATAVR1,PHOENIX IS.,-4,-171,T31,PHOENIX IS.,-4,-171,VR3,LINE IS.,-5,-154
1090 DATAT32,LINE IS.,-5,-154,VR4,SOLOMON IS.,-8,159,H4,SOLOMON IS.,-8,159
1091 DATAVR6,PITCAIRN IS.,-25,-130,VR8,TUVALA IS.,-8,178,VS5,BRUNEI,4,114
1092 DATAVS6,HONG KONG,22.1,114,VS9,KAMARAN IS.,15,42,VU,INDIA,23,80
1093 DATAVU7,ANDAMAN &NICOBAR IS.,12,92,VU7,LACCADIVE IS.,10,73,XE,MEXICO,23,-10
2
1094 DATAXF,MEXICO,23,-102,4A,MEXICO,23,-102,6D,MEXICO,23,-102
1095 DATAXF4,REVILLAGIGEDO IS.,19,-111.3,6D4,REVILLAGIGEDO IS.,19,-111.3
1096 DATAXT,VOLTAIC REP.,12,-1,XU,CAMBODIA,13,105,XV5,VIETNAM,16,108
1097 DATAXW8,LAOS,18,105,XZ,BURMA,22,98,YA,AFGHANISTAN,33,65,YB,INDONESIA,-5,120
1098 DATAYS,EL SALVADOR,13.5,-88.5,YU,YUGOSLAVIA,44,19,YT,YUGOSLAVIA,44,19
1099 DATAYV,VENEZUELA,8,-66,4M,VENEZUELA,8,-66,YV0,AVES IS.,12,-67.3,ZA,ALBANIA,
41,20
1100 DATAZB2,GIBRALTAR,36,5,ZD7,ST,HELENA IS.,15,6,-5.4,ZD8,ASCENSION IS.,-5.6,-
14
1101 DATAZD9,TRISTAN DA CUNHA,-37,-12,ZD9,GOUGH IS.,-40,-9,ZE,ZIMBABWE,-20,30
1102 DATAZ2,ZIMBABWE,-20,30,ZF1,CAYMAN IS.,19,-80,ZK1,COOK IS.,-20,-158
1103 DATAZK2,NIUE IS.,-19,-169.5,ZL,NEW ZEALAND,-41,174
1104 DATAZL,CHATMAN IS.,-44,-176,ZL,AUCKLAND IS.,-52,176,ZL,CAMPBELL IS.,-53,169
1105 DATAZL,KERMADEC IS.,-31,-178.5,ZM7,TOKELAU IS.,-8,-173,ZP,PARAGUAY,-23,-58
1106 DATAZS,S.AFRICA,-30,26,ZS2,PRINCE EDWARD IS.,-47,38,ZS2,MARION IS.,-47,38
1107 DATAZS3,NAMIBIA,-22,17,1A,SOVERIGN MILITARY ORDER OF MALTA,35.5,14.3
1108 DATA1S,SPRATLY IS.,8,112,3A,MONACO,43.5,7,3B6,AGALEGA IS.,-10,56.4
1109 DATA3B7,ST.BRANDON IS.,-17,69,3B8,MAURITIUS IS.,-20,57,3B9,RODRIGUEZ IS.,-1
9,64
1110 DATA3C,EQUATORIAL GUINEA,2,10,EA0,EQUATORIAL GUINEA,2,10,3D2,FIJI IS.,-18,1
75
1111 DATAVR2,FIJI IS.,-18,175,3D6,SWAZILAND,-26,31,ZS7,SWAZILAND,-26,31
1112 DATAZD5,SWAZILAND,-26,31,3V8,TUNISIA,34,9,3X,REP.OF GUINEA,11,-10
1113 DATAZG,REP OF GUINEA,11,-10,3Y,BOUVET IS.,-54,5,LA-LG,BOUVET IS.,-54,5
1114 DATA4S7,SRI LANKA,7,81,3C0,ANNOGON IS.,-2,6,4U,ITU NEW YORK,40.4,-74
1115 DATA4U1,ITU GENEVE,46,6,4W,N.YEMAN,15,44,4X,ISRAEL,31,35,4Z,ISRAEL,31,35
1116 DATA5A,LIBYA,27,17,5B4,CYPRUS,35,33,ZC4,CYPRUS,35,33,5H3,TANZANIA,-6,35
1117 DATAVQ2,TANZANIA,-6,35,5N2,NIGERIA,10,8,ZD2,NIGERIA,10,8,5R8,MADAGASCAR,-19
,46
1118 DATAFR8,MADAGASCAR,-19,46,5T,MAURITANIA,20,-12,5U7,NIGER,16,8,5V,TOGO,8,1
1119 DATA5W1,W.SAMOA,-13.5,-172,5X,UGANDA,1,32,VQ5,UGANDA,1,32,5Z4,KENYA,1,38
1120 DATAVQ4,KENYA,1,38,6O,SOMALI,10,49,6W8,SENEGAL,14,-14,6Y5,JAMAICA,18,-77
1121 DATAVP5,JAMAICA,18,-77,70,S.YEMAN,15,48,VS9A,S.YEMAN,15,48,7P8,LESOTHO,-29,
28
1122 DATAZS8,LESOTHO,-29,28,7Q,MALAWI,-13,34,ZD6,MALAWI,-13,34
1123 DATA7X,ALGERIA,28,3,FA,ALGERIA,28,3,8P,BARBADOS IS.,13,-59,VP6,BARBADOS IS.
,13,-59
1124 DATA8Q,MALDIVE IS.,3,73,VS9M,MALDIVE IS.,3,73,8R,GUYANA,5,-59
1125 DATAVP3,GUYANA,5,-59,8Z4,SAUDI ARABIA & IRAQ NEUTRAL ZONE,30,43,9G1,GHANA,8
,-2
1126 DATAZD4,GHANA,8,-2,9A0,MALTA,35.5,14.4,VQ2,ZAMBIA,-15,30,9J,ZAMBIA,-15,30
1127 DATA9K2,KUWAIT,29,47.5,9L1,SIERRA LEONE,8,-11,9M2,W.MALAYSIA,5,102
1128 DATA9M4,W.MALAYSIA,5,102,9M6,E.MALAYSIA,5,117,9M8,SARAWAK,4,115,9N1,NEPAL,2
8,84
1129 DATA9Q5,ZAIRE,-4,25,DQ5,ZAIRE,-4,25,9U5,BURUNDI,-3,30,9V1,SINGAPORE,1.2,103
.5
1130 DATA9X,RWANDA,-2,30,9Y4,TRINIDAD & TOBAGO IS.,11,-61,VP4,TRINIDAD & TOBAGO
IS.,11,-61
3000 DATAEND,0,0,0
```

performed only when there is a match between what is input by the operator (lines 50 and 60) and what is read in line 100 or when latitude and longitude are entered, main menu selection number 3 (lines 70 through 84).

Line 500 converts A to radians. Lines 510 through 545 determine the value of L and send the program to the correct place as determined by that value. The variable X is used to test the value of L. The first part of line 610 con-

Program listing.

```
Type:     RUN
Display:  **MAIN MENU**
          HOW DO YOU WANT ME
          TO LOCATE DATA?
          1..COUNTRY OR CITY
          2..PREFIX
          3..LAT. & LONG.
          4..QUIT
Type:     1<RET>
Display:  ENTER COUNTRY OR CITY.
          ?
Type:     ITALY<RET>
Display:  SEARCHING DATA
Display:  ITALY
          LATITUDE 42
          LONGITUDE 12
          PREFIX: I
          BEARING: 39
          DISTANCE FROM OGDEN,
          UTAH
          5699 MILES
          9171 KILOMETERS
          (F7) = SEARCH DATA OR
          HIT ANY KEY
Type:     (Function key F7 is located
          on the lower right side of
          the VIC.)
Display:  SEARCHING DATA
Display:  END OF DATA
Display:  (Returns to the main
          menu.)
Display:  **MAIN MENU**
          HOW DO YOU WANT ME
          TO LOCATE DATA?
          1..COUNTRY OR CITY
          2..PREFIX
          3..LAT. & LONG.
          4..QUIT
Type:     2<RET>
Display:  ENTER PREFIX
          ?
Type:     TT<RET>
Display:  CHAD
          LATITUDE 15
          LONGITUDE 19
          BEARING: 50
          DISTANCE FROM OGDEN,
          UTAH
          7437 MILES
          11968 KILOMETERS
          (F7) = SEARCH DATA OR
          HIT ANY KEY
Type:     (Any key.)
Display:  (Returns to the main
          menu.)
Display:  **MAIN MENU**
          HOW DO YOU WANT ME
          TO LOCATE DATA?
          1..COUNTRY OR CITY
          2..PREFIX
          3..LAT. & LONG.
          4..QUIT
Type:     3<RET>
Display:  LATITUDE?
          ?
Type:     -45<RET>
Display:  LATITUDE?
          ? -45
          LONGITUDE?
          ?
Type:     120<RET>
Display:  LATITUDE?
          ? -45
          LONGITUDE?
          ? 120
          IS YOUR INPUT COR-
          RECT?
          1 = YES 2 = NO
Type:     1<RET>
Display:  LATITUDE -45
          LONGITUDE 120
          PREFIX:
          BEARING: 246
          DISTANCE FROM OGDEN,
          UTAH
          9864 MILES
          15874 KILOMETERS
          (F7) = SEARCH DATA OR
          HIT ANY KEY
Type:     (Function key F7.)
Display:  I WILL SEARCH MY FILE
          FOR DATA ON LOCATION
          NEAR YOUR COOR-
          DINATE.
          HOW WIDE OF SEARCH
          IN DEGREES?
          ?
Type:     20<RET>
Display:  SEARCHING DATA
Display:  AUSTRALIA
          LATITUDE -25
          LONGITUDE 130
          PREFIX: VK
          BEARING: 268
          DISTANCE FROM OGDEN,
          UTAH
          8780 MILES
          14130 KILOMETERS
          (F7) = SEARCH DATA OR
          HIT ANY KEY
Type:     (Function key F7.)
Display:  SEARCHING DATA
Display:  AUSTRALIA
          LATITUDE -25
          LONGITUDE 130
          PREFIX: AX
          BEARING: 268
          DISTANCE FROM OGDEN,
          UTAH
          8780 MILES
          14130 KILOMETERS
          (F7) = SEARCH DATA OR
          HIT ANY KEY
Type:     (Function key F7.)
Display:  SEARCHING DATA
Display:  END OF DATA
Display:  (Program returns to main
          menu.)
```

Sample run.

verts L and B to radians. The remainder of line 610 computes the distance angle, looks at its value, and checks to see if it is positive. If P2 is less than 0, 180 is added to its value (line 645).

After P2 is taken care of, the program moves to line 650. Line 650 computes the distance in miles and kilometers. Line 655 computes the bearing angle and converts bearings to degrees rounded to nearest tenth. Lines 670 and 675 determine which quadrant the bearing angle is in and adjust the degrees. Line 680 makes some adjustments to the value of B2. Line 690 makes adjustments to the value of R4. Lines 710 through 865 perform any necessary adjustments to the value of R2, the bearing angle, and send the program to line 900. This is the RETURN statement used to send the program back to the main program after performing the subroutine.

I have not gone into a great deal of explanation of the math routine as the purpose of this article is not to explain the geometry. If you would like a better explanation of this subroutine, I suggest you consult the *ARRL Antenna Handbook* or any other advanced math book.

Conclusion

I hope this program can be of help to some of you. I have used it a lot. I have needed to make some simple changes in the data statements, but I have attempted to keep the program simple enough so that changes can be made easily. I know that this program will have to be updated occasionally. I used the most current information available. Most of the locations are figured to the center of the country, give or take a degree. Most of the small island latitudes and longitudes have been taken to the tenth of a degree to make the data very accurate.

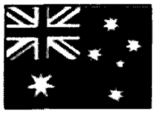
If you find that you do not have the time to type in the program, I will send it to you on tape for the VIC. The cost is $5.00, and I need to know the amount of memory you have. I also have this program for the Apple II Plus and the VIC-20 on disk for $9.00. (Checks should be made out to me at my address, above.) If you do take the time to type it in and run into trouble, write to me describing the problem you are experiencing and I will try to correct it. I know that no program is perfect.

There are many things that can be done to spruce up the program, especially the Apple version. My main goal was to keep it as simple and efficient as possible, but you can have some fun trying to spruce it up a little. You can always add more data as you expand your memory configuration. Have fun and good luck! ■

73 INTERNATIONAL

Each month, 73 brings you ham radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Jack Burnett.*



AUSTRALIA

Jim Joyce VK3YJ
44 Wren Street
Altona 3018, Victoria
Australia

THE AUSSIE YL

How often we have heard the pileups and QRM disappear when a rare DX station says those magic words "Please stand by—there's a YL calling." Even those persistent callers, jammers, and deliberate QRM merchants who have, unfortunately, become a sad fact of life on amateur radio these days seem to go QRT when the ladies are transmitting. Maybe it is chivalry, or perhaps a mark of respect to these adventurous young ladies who have involved themselves in what was predominantly a male hobby in the early days of amateur radio. Every so often, a YL operator is heard who is a fine example of why we OMs have that respect.

Austine VK3YL

Austine Henry VK3YL is such a young lady. As a life member of the Society of Wireless Pioneers and as a member of 54-years standing with the Wireless Institute of Australia, she has the distinction of having the longest YL membership record. In 1930, Austine was awarded a trophy from the WIA for the best piece of home-brew gear in the local WIA home-brew competition.

1930 was an active year for Austine, as she also became a member of the ARRL on April 14, 1930. She has 30 years of membership in the RSGB, plus she has been a member of NZART over the last few years. Austine has really kept her finger on the pulse of overseas amateur-radio activities. No wonder she has many tales to tell of the good old days in radio.

When she received her first crystal set as a child, she immediately pulled it to pieces to see how it worked, graduating to valve [tube] sets that she made herself, gaining enough expertise to pass her experimental license exam on May 13, 1930. Only the third woman to obtain an amateur license in Australia, Austine became VK3YL.

As there was no commercial gear available for amateurs in those days, Austine learned at an early stage how to get the best out of a home-brew 1-Watt-input transmitter. To get the crystals for her sets, she used to do a tour of the city opticians, getting their broken or rejected quartz lenses, and, if successful, would hurry home with them to grind her own crystals.

With this type of equipment, Austine had her first CW contact into Belgium on September 30, 1931, with Baron de la Rouche ON4HM. To commemorate this contact, the Baron sent her a bronze replica of the Sacred Guardian Monkey of Mons. She also had a successful contact with a South African amateur in the early 1930s, using a UV199 tube fed with dry batteries, with less than 1 Watt of input power, in a portable situation.

Being an adventurous young wisp of a girl, Austine was fond of horseback riding and driving a little sports car, plus riding motor bikes. It was only natural, therefore, to take up flying. On September 6, 1933, she became the first woman admitted to the Royal Australian Air Force Radio Reserve, the training for which included flying around in a Wapiti biplane. This plane, although old, was very solidly constructed and was used extensively to train both pilots and radio operators, with the pilot in the front cockpit and the radio instructor and pupil in the back cockpit. With these cramped conditions, the student virtually had to sit on the instructor's knee (lucky instructor!). The main requirement for flying in these conditions was to stand up when you landed. Otherwise, it the landing was bumpy and you were sitting down, you could crack your skull on all the gear.

Austine was most upset that they would not send her to the war zone as a radio operator in one of the planes, just because she was a woman, but despite other commitments during WWII, she spent a lot of her spare time at the WIA on a volunteer basis, instructing service personnel and others in the art of Morse code. It was not unusual for Austine to take them into her own home for free private tuition so that they could pass their exams.

After WWII, Austine maintained her interest in amateur radio, with a particular interest in DX. One of her most interesting contacts was in 1957 with Michael FO8AP/MM, on the ill-fated Tahiti Nui raft expedition between Tahiti and Chile. This expedition ended up 600 miles short of Chile when the raft broke apart after a week of storms. Michael was using a transceiver with 1 Watt of input power at that time. Can you imagine trying to send SOS, plus your position, on a raft of 20-inch logs that are breaking apart in the middle of the ocean with 30-foot waves pounding down on you? That would definitely take a steady hand on the key.

CW is a mode at which Austine has remained very proficient, proof of this being her entry to the DXCC Honor Roll as the first and only Australian YL to gain this achievement, but this is only one of Austine's many firsts in the field of amateur radio. Up until 25 years ago, Austine was using only a 40-meter Zepp antenna, graduating to a half-wave centerfed dipole, but in the last few years she has upgraded her antenna system to a triband beam. Her transmitters have graduated from home brew, to converted surplus WWII equipment, to these days, when she is using Drake equipment.

Austine Henry VK3YL.

Austine is quite proud of some of her earlier award achievements, some of which are: the first to work WAC-YL, Certificate No. 22 for the YL-DXCC from Canada (hand-printed in gold), and from Heather Mitchell VK3AZU (the designer of the Alara award), a certificate for being the first VK YL to receive this award.

Those are only a few of the various awards Austine has to her credit. She is also a foundation member of Yasme, winning Certificate No. 7 in the prestigious Yasme award, one in front of the famous Don Wallace W6AM who got Certificate No. 8 in 1980.

What more can be said about a woman who, after 54 years of amateur-radio operating, is still heard in the pileups, keeping her operating techniques in CW and SSB sharp, just in case there comes on the air one of the four countries she still needs to have worked the lot.

88s, Austine!

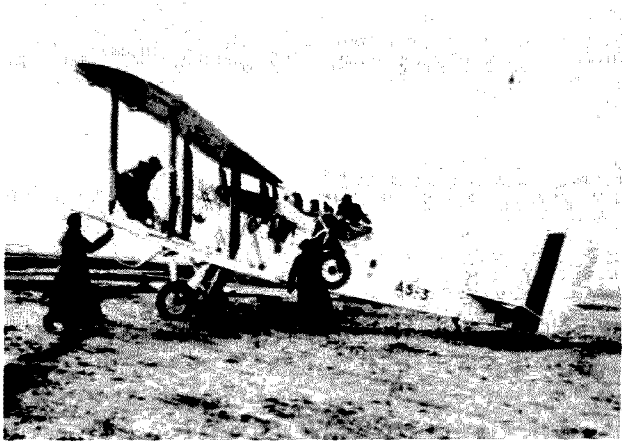
CB RADIO

CB radio has been both a blessing and a curse to amateur radio in Australia. It started with the truckers in the Blue Mountains of New South Wales (VK2), where it was put to good use as a safety device on the narrow, steep hills, but with the showing of the film *Convoy*, all of the rest of Australia became aware of what was to become a loss of 27 MHz to amateur radio in Australia and a headache for our Department of Communications, but a boom for amateur radio.

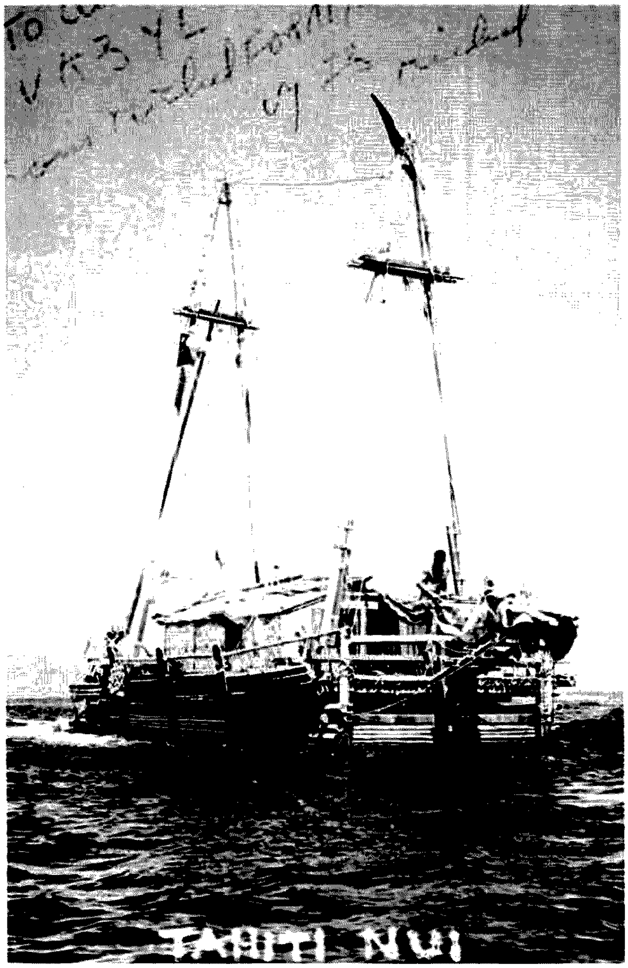
With the interest created by CB, it did not take long for people to realize that with ever-increasing chaos on 27 MHz, there had to be something better in the field of communications. It is here that both the Wireless Institute of Australia and the DOC, to their credit, got together with the result being a Novice class of amateur license.

To pass this, you had to answer a 50-question, multi-choice paper on relatively easy electrical laws, operating procedures, and basic radio theory. You also had a 30-question paper on rules and regulations (multi-choice). Your CW test was at 5 wpm, send and receive.

If you passed this exam, you were allowed to operate both SSB and CW on a section of 10, 15, and 80 meters, with a maximum power output of 30 Watts PEP. A few countries have been thinking of also



Point Cook, 1933: The Wapiti in which Austine 3YL/3D6 made her flying debut. (Picture given to her by Jim 3NY/3B6.)



The card sent to Austine by Michael FO8AP/MM who, here in 1957, is looking over the rear of his raft.

introducing a similar Novice-class license and, going by the upsurge in amateur radio in Australia, it would be a good thing, as up until the advent of CB and the Novice-class license, the amateur-radio scene in Australia was virtually stagnant.

As an example, going by WIA membership (which has remained at approximately 60% of the total amateur population), from 1963, with 3,500 members, to 1973, there was an increase of 1,000 (28%), but by 1983, with the advent of CB and the Novice license, there was an unprecedented upsurge in new amateurs and membership was 8,500. That represented a 53% 10-year increase, nearly twice that of the previous 10-year period.

However, like everything else in life, you get nothing for nothing. The cost to the amateurs so far has been the loss of the 27-MHz band and, with retailers down here now quite blatantly advertising CBs with a frequency coverage of 26.965 to 28.805 MHz in 5-KHz steps, how long before we also lose 28 MHz?

"It will never happen," I hear the oldtimers saying into their 807s, but the CB fraternity in Australia now legally has 40 channels and no restrictions on antennas (six-element beams are quite common) plus freely-advertised linear amplifiers of up to 600 Watts output for 27 MHz. What happened to the legal limit of 12 Watts PEP for CB? The CB operators in Australia also enjoy a section of the UHF band quite legally, with access to repeaters and, believe it or not, freely-advertised linear amps for UHF.

I would not be surprised if in the near future, due to our archaic import and resale laws in Australia, 14-MHz sets appear for resale, as it is quite legal to import and retail any type of equipment providing it is not dangerous to health or does not interfere with emergency services. A CB operator can quite legally buy himself an FT-902DM with an FL2100Z linear, connect it to his 6-element monobander and, unless he causes interference (with a resulting visit from the overworked DOC investigator), can operate illegally to his heart's content.

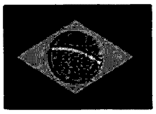
That is the negative—but worth thinking about—side of the CB input to amateur radio in Australia.

The positive side has many pluses. It is not unusual to hear on the CW section of the Novice band a couple of Novices rattling away on CW at 20 wpm; some are even faster. These speed merchants on the key usually are ex-service signal personnel or postoffice telegraphists who, over the years, have forgotten all about radio but, with the advent of the Novice license, have found that with a little study on solid-state basics, they can get back into the communications field. As most of these gentlemen are now retired, they tend to study and get their full-call license. The result is that many ex-signal ops of the various services during WWII now get on the air with their own net frequencies to chew the fat about old times.

We also have the lifetime SWL who could not pass the previous license test for the full call, but now, due to the Novice license, with a bit of study is able to transmit to stations he has logged as an SWL over many years.

In conclusion, due to the upsurge of CB radio we have had both gains and losses, and only time will tell if it has been good for amateur radio in Australia. I do personally feel, however, that with the advent of the latest toy, namely a cordless telephone with a 9-km range (together with other as-yet-untested frequency damaging devices being imported into this country), we may suffer an unprecedented interference problem on the amateur bands and commercial frequencies.

The extent of such interference could be such that the Department of Communications (DOC) may have some difficulty in controlling it, as in past instances with 27 MHz. There is some ray of hope, however, since at this very moment a new Act of Parliament (Radio Communications Bill) is in the final stages of debate and is expected to pass the Senate shortly. When this occurs, the Department of Communications will have little difficulty in obtaining a prosecution against illegal operations, since the mere possession of transmitting equipment without a license or just cause will be an indictable offense.



BRAZIL

Gerson Rissin PY1APS
PO Box 12178, Copacabana
20000 Rio de Janeiro, RJ
Brazil

Carlos Vianna Carneiro PY1CC
Rua Afonso Pena 49, Apt. 701
20270 Rio de Janeiro, RJ
Brazil

QSL BUREAU

The Brazilian amateurs who are members of the League (LABRE) may use the QSL Bureau to send and receive their QSL cards, free of charge. In this way, each QSL Bureau handles thousands of cards monthly and it is easy for us to spread out our QSL cards around the world. Inside Brazil, the service is very good and fast. The QSL travels from one Bureau to another in only one day.

Working so well, it is not difficult to receive a Brazilian card via the Bureau after a short time. Foreign amateurs may also send their QSL cards to Brazil, addressing them to the OSL Bureau when they are not able to find out the right direction. The QSL Bureaus are located in all capital cities (see box). The main one is in Brasilia, the Federal District.

QSL BUREAUS IN BRAZIL

Bureau	Address
PP1	PO Box 692, 29000 Vitoria, ES
PP2	PO Box 676, 74000 Goiania, GO
PP5	PO Box 224, 88000 Florianopolis, SC
PP6	PO Box 259, 49000 Aracaju, SE
PP7	PO Box 80, 57000 Maceio, AL
PP8	PO Box 283, 69000 Manaus, AM
PR7	PO Box 168, 58000 Joao Pessoa, PB
PR8	PO Box 372, 65000 Sao Luiz, MA
PS7	PO Box 251, 59000 Natal, RN
PS8	PO Box 137, 64000 Teresina, PI
PT2	PO Box 07/0004, 70200 Brasilia, DF
PT7	PO Box 975, 60000 Fortaleza, CE
PT8	PO Box 149, 69900 Rio Branco, AC
PT9	PO Box 008, 79100 Campo Grande, MS
PV8	PO Box 148, 69300 Boa Vista, RR
PW8	PO Box 84, 78900 Porto Velho, RO
PY1	PO Box 58, 20001 Rio de Janeiro, RJ
PY2	PO Box 22, 01000 Sao Paulo, SP
PY3	PO Box 2180, 90000 Porto Alegre, RS
PY4	PO Box 314, 30000 Belo Horizonte, MG
PY5	PO Box 1455, 80000 Curitiba, PR
PY6	PO Box 533, 40000 Salvador, BA
PY7	PO Box 1043, 50000 Recife, PE
PY8	PO Box 71, 66000 Belem, PA
PY9	PO Box 560, 78000 Cuiaba, MT

RESULTS OF THE HUNTING LIONS ON THE AIR CONTEST—1983

The principal objective of this contest is to create and foster a spirit of international understanding and cooperation among Lions and ham-radio operators through worldwide communications. The contest is held in tribute to the birthday of Melvin Jones, the founder of Lionism. It is sponsored by Lions and coordinated by the Rio de Janeiro (Arpoador) Lions Club.

About 13,000 contacts were made among stations located in 114 countries. In the Single-Operator Class—Phone, the winner was VK6NO, followed by K7OX, ZD8JD, ZL1SZ, and PY1BPE. In the Single-Operator Class—CW, the highest score was for the very well-known operator Tim Chen BV2A, followed by PY2ASV, OH6OC, K4EBT, and OH9SV. For the Club Station Class—Phone, the winner was GJ3DVC, the Jersey Amateur Radio Society, and in CW, CT1ARS, the Southern Radioamateur Association of Portugal.

MCG AWARD

Sponsored by the Morse Clube Gaucho (CW Group), the MCG Award is available to all licensed amateurs for confirmed contacts with 5 (five) different MCG members. Contacts must have been made after May 1, 1980, on any amateur band, only two-way CW mode. No QSLs. Send GCR list of stations worked (call, date, time, band, mode, and report) and 5 IRCs for mailing expenses to: MCG Bureau, PO Box 2180, 90000 Porto Alegre, RS, Brazil.

For SWLs, the same rules apply.

MCG members: PY3AVF, PY3AZL, PY3AKS, PY3AZ, PY3AO, PY3BC,

PY3BYC, PY3BVI, PY3BOG, PY3BCD, PY3CMH, PY3CJI, PY3CFD, PY3CMZ, PY3CKI, PY3CNY, PY3COR, PY3CGJ, PY3CGW, PY3CEM, PY3FMC, PY3FJ, PY3FS, PY3HR, PY3HS, PY3JJ, PY3LIM, PY3MU, PY3OH, PY3OS, PY3PO, PY3PR, PY3SM, PY3TT, and PY3ZZ.

THREE STARS AWARD

Sponsored by the David Barros Scout Group, GREDB, the Three Stars Award is available to all licensed amateurs for confirmed contacts with 2 (two) GREDB members plus a contact with PY1EDB (the group station) and contacts with three different Brazilian prefixes. Contacts must have been made after January 1, 1962, on any amateur band and any mode. No QSLs. Send GCR list of stations worked (call, date, time, band, mode, and report), your personal QSL, and 10 IRCs for mailing expenses to: GREDB, PO Box 20033, 21022 Rio de Janeiro, RJ, Brazil.

GREDB members: PY1s ABK, AFA, AMG, ATR, AVV, AWA, AZF, BCZ, BON, BGI, BLG, BM, BPU, BUF, BV, BVB, CBG, CBW, CC, CCD, CCE, CCK, CCO, CDA, CGB, CKL, CKV, CKY, CLI, COA, CPC, CQV, CIP, DCO, DED, DIA, DWP, DMX, EEX, ELU, ENN, EHD, ER, FP, IP, IR, NE, RI, TBG, TBW, TCI, TFU, TFQ, TFW, THH, TNV, TOM, TPH, TPW, TTF, TTH, TUP, TUQ, UBX, UVP, USU, VBR, VIZ, VKK, VOP, VTU, VXO, WFR, WHO, WIO, WIR, WTA, XHK, XRI, XRX, XXP, YDQ, YJD, PY2BI, and PY4BCF.

JUBILEE OF LABRE

On February 2, 1984, the Brazilian Amateur Radio League (LABRE) will celebrate its 50th anniversary. The IV Brazilian Convention joining amateurs of the whole country will be held in Brasilia, the Federal District, for this purpose.

Besides the meetings and parties, etc., the convention will sponsor a lot of tourist happenings for those who haven't had the opportunity to know the capital city yet. In collaboration with LABRE, three excellent hotels will offer special prices for the amateurs.

Valmir J. Pereira PT2FA, President of LABRE, will do all he can to promote unforgettable events. For further information, please write to LABRE, PO Box 070004, 70000 Brasilia, OF, Brazil.

QSP-DX

To provide information for Brazilian DXers, Luc PT7WA with a group of PT7 friends established the *QSP-DX Bulletin*. In the bulletin, written in Portuguese, we can find details about DXpeditions, contests, rare countries on the air, QSL information, and everything interesting to the DXer, especially the newcomer.

The bulletin is bimonthly; after the second issue, about 150 amateurs had already subscribed. The subscription fee is only enougn to pay the printing and mailing expenses. If you want to provide the bulletin with any DX information, please write to *QSP-DX*, Rua Ageu Romero 83, 60000 Fortaleza, CE, Brazil.

CWMG AWARD

Sponsored by the Minas Gerais CW Club (CW Group), the CWMG Award is available to all licensed amateurs for confirmed contacts with 5 (five) different CWMG members. Contacts must have been made after May 1, 1978, on any amateur band, only two-way CW mode. No QSLs. Send GCR list of stations worked (*call*, date, *time*, band, *mode*, *and* report) and 8 IRCs for mailing expenses to: CWMG Award, PO Box 314, 30000 Belo Horizonte, MG, Brazil.

CWMG members: PY4AAF, PY4ABI, PY4ACV, PY4AD, PY4ADW, PY4AFP, PY4AH, PY4AM, PY4AP, PY4APF, PY4AOL, PY4AOM, PY4AUB, PY4AUN, PY4BAT, PY4BCR, PY4BLR, PY4BMO, PY4BZS, PY4BW, PY4CMG, PY4CO, PY4DD, PY4DM, PY4DS, PY4DT, PY4HR, PY4IF, PY4IR, PY4IS, PY4JD, PY4KS, PY4LB, PY4LJ, PY4MA, PY4MG, PY4OA, PY4OD, PY4OP, PY4PR, PY4RA, PY4RL, PY4SM, PY4SS, PY4ST, PY4WG, PY4WAS, PY4XUP, PY4ZI, and PP2ZI.

GMPR AWARD

Sponsored by the GMPR Group of CW, the GMPR Award is available to all licensed amateurs for confirmed contacts with 8 (six) different GMPR members. Contacts must have been made after July 30, 1982, on any amateur band, only two-way CW mode. No QSLs. Send GCR list of stations worked (call, date, time, band, mode, and report), your personal QSL, and 10 IRCs for mailing expenses to: GMPR Award, PO Box 4143, 80000 Curitiba, PR, Brazil.

For SWLs, the same rules apply.

Endorsements: Besides the six GMPR members, confirmed contacts with 2, 3, 4, or 5 stations located in the State of Parana (PY5) earn an endorsement. It is not necessary that they be GMPR members.

GMPR members: PY5AFC, PY5AFD, PY5AGX, PY5AGZ, PY5AIO, PY5AIW, PY5AKX, PY5ALF, PY5AVR, PY5BYC, PY5CIG, PY5CL, PY5CMS, PY5FI, PY5GI, PY5GJ, PY5HF, PY5IG, PY5IJ, PY5JL, PY5LA, PY5NGA, PY5OE, PY5PMR, PY5AJE, PY5RT, PY5VX, PY5XFR, PY5ZW, and PY1BVY.

de PY1APS

1983 WORLDWIDE SOUTH AMERICA CW CONTEST

Sponsored by the Brazilian magazine, *Eletronica Popular*, and supervised by the Argentina GACW group and the Brazilian PPC Picapau Carioca, the 1983 WWSA CW Contest was a hit, considering it's only in its second year.

Little by little, slow but sure, hams are coming to this contest, the only one gathering South American countries and spreading QSOs all over the world during 24 hours of operation, from 1500 UTC Saturday to 1500 UTC Sunday, the last weekend in June.

Not only the fun of the party, but also this FB opportunity of meeting bunches of still rare South American calls and special prefixes is raising DXers' interest for this unique WWSA CW Contest.

Argentina's, Uruguay's, and Brazil's groups and DXers are trying hard to bring more and more South American countries to the fun, thus aiming at increasing the interest of hams in other continents in the WWSA CW Contest.

We sure hope to meet many of you at the 1984 WWSA CW Contest, to take place from Saturday, June 9, 1500 UTC to Sunday, June 10, 1500 UTC.

1983 WWSA CW CONTEST

DX STATIONS		
3.5 MHz	YO3HP	
7 MHz	LZ1GC	850
	YO3CD	600
	Y51XE	280
14 MHz	JH3DPB	2,184
	W4VQ	1,278
	HB9BPP	864
21 MHz	OK2QX	2,728
	EI3DP	1,600
	Y32KE	1,122
28 MHz	VE1BNN	1,254
Multiband	W3GM	27,710
	YU4YA	18,492
	LZ2DB	14,384
Multi-op	LZ1KDP	27,600
	SP9KTE	7,296
	OK3KEX	5,760
Continental Winners		
Asia	JA1BX	2,132
Europe	YU4YA	18,492
North Am.	W3GM	27,710
South Am.	CX7BY	266,304

Continental Leaders		
Multiband/Multi-op		
Europe	LZ1KDP	27,600
South Am.	PY1EDB	650
SOUTH AMERICAN STATIONS		
3.5 MHz	CX8DT	1,296
	PY2RNJ	84
	PY2OHJ	8
7 MHz	CX5AO	22,180
	PY3CFD	2,730
	PY5AAZ	280
14 MHz	YV5HUJ	60,588
	PY5MR	3,312
	PY2DRP	2,604
21 MHz	PY1DFF	37,904
	LU4FC	32,472
	PY1BVY	31,044
28 MHz	PY1HQ	15,984
	PY3XYZ/PP2	10,740
	PY1DPP	2,840
Multiband	CX7BY	266,304
	LU9EIE	222,222
	PT9EJ	87,720
Multi-op	PY1EDB	650

CANADA

Cary Honeywell VE3ARS
PO Box 2610, Station D
Ottawa, Ontario K1P 5W7
Canada

The Department of Communications in Ottawa recently lifted the requirements for logging in Canada. For some amateurs, this action means nothing, as I am sure better than half of the amateurs across Canada never logged their activities anyway. Rarely, if ever, was this requirement checked. It should be remembered, however, that logging is a form of self-defense in that you can always refer to your log should you be accused of an infraction of the regs.

The Canadian Amateur Radio Federation and the Canadian Division ARRL (CRRL) met at Cobourg, Ontario, during the summer to finalize a joint submission to the DOC regarding TRC24 (the requirements for examination for the amateur service). Between the two organizations, every area of importance was covered.

Each group submitted its own proposal and it seems that the DOC was open to these suggestions. The resultant redrafting of TRC24 should be common knowledge by this time. A great deal of credit for this work can be shared by many parties. Art Blick VE3AHU of Kingston, Ontario, the CARF General Manager, Ron Walsh VE3IDW, also of Kingston and one of CARF's Vice-Presidents, CRRL president Tom Atkins VE3CDM of Toronto, and ARRL Canadian Division Vice-Director Harry MacLean VE3GRO of London, Ontario, carried the amateur flame in a cooperative and constructive manner. The DOC was represented by G. Wintermeyer from the head office in Ottawa.

The 1983 CARF National Symposium was held in Halifax, Nova Scotia, during the middle of October this year. For those of you who don't know what this is: Amateurs from across Canada get together once a year (en masse) to provide direct input to the DOC on matters relating to the amateur service in Canada. The number of people attending these conferences is not usually great since most groups of amateurs provide only written submissions to be read and considered. This is far less expensive than sending a representative across the country for a one-day event. Full details will be provided in a future column.

A while back, a group of white caners in Toronto, Ontario, organized a reception to express appreciation for the work of an individual. Bill Choat VE3CO was stepping down as chief of the CNIB amateur-radio operation in Toronto, and some of his charges wanted him to be recognized for his efforts in the past. Bill has been in charge of this group for many years now, and through his efforts and the efforts of others, many white caners were given the opportunity to experience the joys of amateur radio, despite their handicap. Nearly 100 blind and sighted amateurs participated and I think Bill went away with the feeling that all was right with the world.

Canada's national amateur-radio journal, *TCA*, has been plagued with postal problems for several years now. Recently, an Ontario amateur wrote the Minister responsible for Canada Post, complaining of the late delivery of his July/August copy. Some time later, I, as editor of *TCA*, received a call from a Canada Post employee who wanted to know when the magazine had been mailed. When the caller discovered that more than three weeks had passed between mailing and delivery, she became very defensive and tried to leave me with the impression that the system was not only better than it was, but would get better as *time* went by. She would not elaborate on what amount of time would pass before this event, but I got the distinct impression that it would coincide with the "second coming," or at least the blooming of century plants.

Speaking of *TCA*, the November issue was mailed to every amateur in Canada as part of a membership drive on behalf of CARF. Canadian amateurs *living* in the USA did not receive a copy due to postal limitations and costs. If you would like to receive one, please write to the Canadian Amateur Radio Federation, PO Box 356 Station, Kingston, Ontario, Canada K1P 5W7. Depending on numbers remaining, we may be able to send you a copy. Enclose $1.50 to cover postage and handling costs (mostly postage). You will notice that this is also the cover price, so it balances out.

CZECHOSLOVAKIA

Rudy OK3KFO
Februaroveho vit'azstva
955 01 Topol'cany
Czechoslovakia

I have 25 years. I am a member of Radioclub OK3KFO in Topol'cany and have been an active amateur for 13 years. My call is OK3CMZ. I hope that you *73*

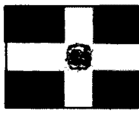
magazine readers will enjoy the information I send. Please excuse that I am self-taught in the English language.

I should like to inform readers of *73* about radio-amateur life in Czechoslovakia. In Czechoslovakia, we have approximately four thousand licensed radio amateurs, not counting 1500 SWLs. The most activity is in DX work; there is less activity with contests.

Czechoslovakia is a little republic. One day a week—Thursday—OK3KAB in Bratislava (capital city of Slovakia) broadcasts about all radio-amateur activity. The program is popular because it sends quality information.

Approximately 10% of the people work 144 MHz and 433 MHz. Over the last 10 years, Czechoslovakian microwave stations have reached good places in international contests. Other OKs are working over satellites, and approximately 10 work EME. Tens of thousands are devoted to constructing various mechanisms.

I know my first column is not very interesting so I would like readers of *73* to ask for what they would like to know about activity in Czechoslovakia.



DOMINICAN REPUBLIC

M. F. (Tim) Pimentel HI8MFP
PO Box 2191
Santo Domingo
Dominican Republic

Some of you have probably worked Dominican (HI) stations in the 20- or 15-meter band but have been less fortunate in contacting the other bands and getting QSLs.

To contact and get QSLs from HI is not an easy task, and exotic bands such as 6 and 160 meters seem to be "Mission Impossible," but even so, there are possibilities.

To be successful, you first have to know which station you're looking for, at what time you should search for it, and last, be lucky enough to find it. Once you have made your contact, it will be easy for you to receive the QSL because there are few people who work on 6 and 160 and those who do confirm on time.

In the 6-meter band we have key people such as Waldo HI8WPC and Domingo HI8DAF. The same applies in the 160-meter band with Jose HI8JAG, Mike HI8MRF, and Virgilio HI8VMA. These stations generally work from 0000 GMT to 0800 GMT. Within these times, schedules could be arranged by sending the abovementioned stations a note to Box 1157, Radio Club Dominicano, Santo Domingo, Dominican Republic.

Another difficult HI contact is the one via satellite. The only representative there is Jorge HI8JAF, and he is on the radio as long as his business activities allow him. Jorge is one who loves that particular type of communication, and on the first DXpedition to Beata Island (HI1RCD) in 1979, he made some contacts there. If any of you are interested in this particular kind of communication with an HI, you could write for additional information to: Jorge Abbott HI8JAF, Rafael F. Bonely *#8*, Ens. Evaristo Morales, Santo Domingo, Dominican Republic. I am sure he will fix a schedule and the QSL will get to you safely.

Another contact mode considered unobtainable in HI is CW. In the Dominican Republic, anybody who expects to get a ham-radio license is supposed to go through a CW exam. However, this is only in theory, because there are no effective mechanisms to guarantee that it will happen. For those 1500 that have already received their licenses, there's nothing to be done. The practice of CW is restricted to fewer than 1% of those listed in the *Callbook*; nevertheless, among them there are some excellent operators.

In CW, we have two young operators who are very good, Juiito HI3JEI and Carlos HI8CPT, plus the hard-working veterans HI3PC, HI8LC, HI8OMB, HI8KW, HI8RPD, and HI8DAF.

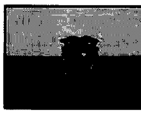
The Dominican Radio Club frequently offers CW courses to its members and guests; thus it maintains a live spirit in this mode even though it has lost popularity in our country.

Can you get a contact with a YL in the Dominican Republic? For chatting there may be some, but for QSLs and DXs, there are very few. However, there are some surprises: Charo HI8RPD enjoys DX, works regularly, works with CW, and sends QSLs besides. You can also find Azilde HI7HHH or Maritza HI8MSS, and both will send their QSLs gladly.

Undoubtedly the language barrier limits many HI ham operators, so communication is made more difficult. On the other hand, the small active group in DX knows English well enough to obtain their contacts. Abed HI8IH and Victor HI8VAT look frequently for DX on 40 and 80 meters, and the same goes for an active group in the HI3 zone with Antonio HI3AMF leading them.

It is my hope that, with these hints, it will be easier to get HI stations and your QSLs, too. Also, for five years, the Dominican Radio Club has had a national campaign among ham-radio operators to stimulate the sending of QSLs, and the results have been positive. The annual average has increased more than 70%. The QSL Bureau is managed by the Dominican Radio Club and has worked efficiently for many years.

Before closing, I'd like to add that we know how important QSLs are and how much they mean, especially to DXers. We will be glad to help you find confirmation of a contact which was made during the past five years; we will help all we can.



ECUADOR

B. Patricio Recalde S. HC2PP
PO Box 511
Guayaquil
Ecuador

July 23 and 24 last year will be remembered by the technical department of the Guayaquil Radio Club as historical. They were a Saturday and Sunday. What did we do?

Well, a party of amateurs, HC2NW, HC2OL, HC2IH, HC2LU, HC2NS, and HC2KY, went up Chimborazo, the highest volcano in Ecuador (6,310 meters—18,930 feet), in order to install a 40-meter link in a 2-meter repeater. The idea became reality after a mere four weeks of planning. All Saturday they kept working until around 1700 hours, which is late for the altitude at the repeater (4,400-4,500 meters—13,500 feet). They did a lot of testing, and now it is giving the best results.

Now, from all the coast part of our country, it is possible to access the repeater from your car and get through to 40 meters. The frequency is 7080 kHz, and you'd better look for Ecuador so you can test the 40-meter/2-meter link.

Getting there was a lot of fun (troubles + adventures = fun). Saturday evening, HC2IH's car got stuck in mud and snow, and on the way out, the steel bar that keeps the front wheels aligned broke loose. Well, at that time and in that place, all that was left to do was sleep and wait until the next day. The hero (?) who slept in the car (with the engine running, the heater on) was HC2LU. The temperature was below freezing (0° C), so the car didn't even heat up.

Anyway, on Sunday was a tougher test: to try to reach the members of an expedition that was on the Irazu volcano, at 4,250 meters, in San Jose, Costa Rica (TI)! A lot of arrangements had been made through the goodwill and work of TI2KC and HC2EC. At those heights, the wind, the temperature, etc., were a challenge; the people at both places did a good job preparing for the contacts.

In San Jose, they were ready with 10,000 Watts FM, SSB, and HF. The link in 40 meters was not working due to the lack of a better antenna with the Chimborazo expedition, so HC2PP was the guy that linked them all together via 2 meters and 40 meters. While everybody was getting ready, many amateurs from all places were very helpful in clearing frequencies and giving good advice.

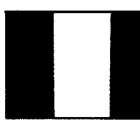
Exactly at 12:23 (HC)—1723 GMT—on July 24th—the Irazu expedition transmitted on 146.500 MHz with no results. After a few tries on FM and SSB on 2 meters, there were no positive contacts; the same was true with the Chimborazo expedition. Around 1800 GMT, we tried through a repeater situated where the Ecuadorian expedition was, and we heard three times that the repeater was activated. No modulation, but it gave us a nice feeling of something!

Anyway, after two hours, all the equipment and gear were diassembled. Our president, HC2KC, and the president of the Costa Rica Radio Club (TI2KC) interchanged greetings and thanks for all the efforts, and both confirmed that in the near future, with more testing, the link is going to work.

Well, they decided to try more testing in a new place, Cerro de la Meurte (Death Mountain), that is believed to be better. All amateurs who participated were not frustrated; we believe it is going to take some more coordinated efforts, and we are positive about out next results.

There is another project, and that is to try to put a repeater on a small island that belongs to Panama. Why? Because HC2NS, on old sailor, did access the repeater 146.895 (−) from that point, which is more than 200 nautical miles from the repeater, at 4,400-4,500 meters above sea level!

I will keep you informed, and we *are* going to make it!



FRANCE

Claude Guae F1DGY
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28100 Dreux
France

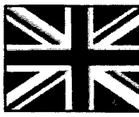
I would like to say some words about the first French association (REF—Reseau des Emetteurs Francais), founded in 1925. Some years ago, the situation was rather confused, but thanks to the work of a new and very good team, it is now completely reversed. We see that REF again has a fine future! Furthermore, dealings with the second association (URC—Union des Radio-Clubs) are more hearty than formerly. At the beginning, the two were at daggers drawn, but now they cooperate in facing difficulties (new license examinations, UHF, regulations, etc.).

Some hams and SWLs are getting in trouble: They have bought general-coverage receivers, called "scanners," which unfortunately are illegal here. As a matter of fact, people are brought up for trial and convicted (with a fine and receiver confiscation). However, REF has lodged an appeal. The law amounts to saying that French hams have the right to listen only to the amateur allocations. No comment.

Once again, we have heard on the air that tickets for part of the 28-MHz band would be granted without a Morse-code test. Actually, this is utterly false. It is a CB rumor which till now officials have turned down. On the other hand, new regulations for 27 MHz are generous: 40 channels, 4 Watts SSB (peak), 4 Watts FM, 1 Watt AM, and the possibilities of 6-dB-gain antennas. It goes without saying that CBers are not yet satisfied. This band is so busy that some people escape to the 6-MHz band.

65-year-old hams without Morse-code knowledge can ask again for the full licenses (F6) without taking the 10-wpm test. Since the beginning of this year and the new license regulations, this gift had been forgotten.

A new ham magazine is born: *Megahertz*. Covering microcomputers, astronomy, private FM broadcast, and of course all ham activities, this third French ham magazine looks promising and means that amateur radio in France enjoys good health!



GREAT BRITAIN

Jeff Maynard G4EJA
10 Churchfields
Widnes WA8 9RP
Cheshire
England

One of my particular interests is RTTY (WAC and some 70 countries worked to date). The RTTY enthusiast over here is well looked after by BARTG, the British Amateur Radio Teletype Group, which promotes RTTY activities, contests, and awards, advises on RTTY matters, transmits a RTTY bulletin, and publishes the BARTG newsletter. (Readers interested in joining BARTG should write to the Membership Secretary, Mrs. T. Crane, Greta Woods, Bromley Road, Ardleigh, Colchester C07 7SF, England—dues are about US$5 per year.)

A recent BARTG survey reveals that about 65% of its members still use traditional clanking teletypes tor their RTTY with the Creed line (444, 54, 7, etc.) being by far the most popular. Even more surprising, to me at least, was the comment that a number of stations have 4 or 5 such machines in constant use. I am not sure that the floor of my shack (in the house loft) would stand the weight of even one such machine. I am sure though that the rest of the family would rebel at the noise from a traditional teletype.

Something like 34% of BARTG members use electronic RTTY systems or home computers (with 5% using AMTOR). Commercial units are best represented by the Microwave modules line although Hal has captured about 13% of the UK market.

With my own all-electronic RTTY station (Dovetron terminal unit, Extel VDU, and ma-

Continued on page 116

Dave Schmarder N2DS
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Beaver Dams NY 14812

Convert the Oddball Hy-Gain Board

Some of these boards have two crystals and some have three. Now you can put them all on 10-meter FM.

Recently, the popularity of the Hy-Gain surplus boards has been tremendous. However, there are several types of these boards on the market today, and each type requires a different method of attack. The 3-crystal model with the PLL-02 phase-locked-loop chip has been well discussed in a previous article.[1] The board I am going to discuss is the board with the part number PTBM051AOX, available from Surplus Electronics Corp.[2]

The major differences with this board compared with the other Hy-Gain boards is the 2-crystal approach. The third offset crystal has been eliminated so that all frequencies are generated by the 10.24-MHz reference crystal. The other crystal, 10.695, is used to offset the synthesizer/mixer output by the amount of the receiver first i-f.

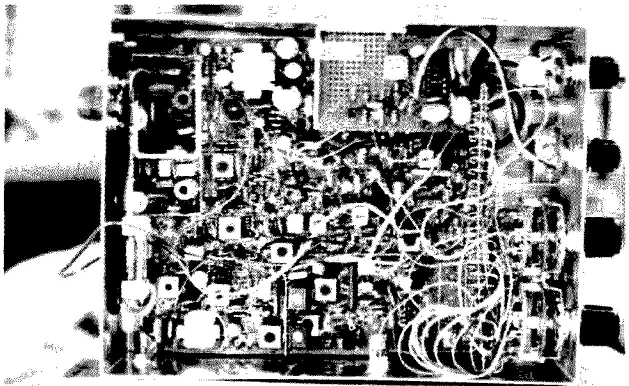
This presents three problems. First, with this mixing process, the PLL programming is upside down. That is, if you increase the divide-by-N, the frequency goes down, and since a prerequisite of any of my 10-meter FM conversions is a direct frequency readout system, this makes it a bit difficult. The second problem is that you cannot decide what divide-by-N equals which frequency. This is decided for you. The third problem is the odd 5-kHz output frequency. By that I mean that when this conversion is made, we want the operating frequency of the transceiver to be 29.600 MHz, not 29.595 or 29.605 MHz. So a change will have to be made there. All that is done here is to raise the reference frequency slightly, making each channel a few Hertz more than 10-kHz channel spacing.

Circuit Description

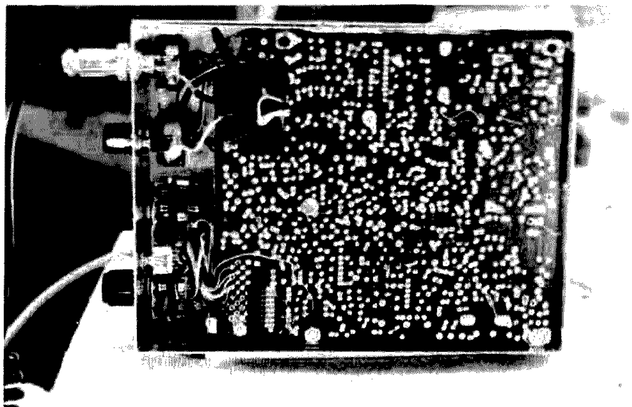
There will be three added circuits to the original board. Those are the FM detector/squelch board, the modulator board, and the frequency-selector board.

The FM detector/squelch board (see Fig. 1) consists of one IC and two transistors and is designed to interface the CB board easily. The 2111 IC is a common IC that is used in television receivers and scanners. This chip provides the i-f limiting and the quadrature detection necessary for FM detection. Transformer T01 is tuned to 455 kHz, and the transformer can be obtained from an old transistor radio. The primary winding is used.

The noise to operate the squelch is taken from pin 1 of the IC which is before the de-emphasis capacitor, C01. The noise is filtered and amplified by the two-



A top view of the radio. Notice the mounting of the three added boards.



This is a bottom look with the cover removed. Next to the piece of electrical tape is the connection to the input of the FM detector/squelch board.

transistor circuit, and the output is applied to the base of the audio switch in the receiver (Q13). The input at C02 is taken from the secondary of the last i-f transformer through a short length of RG-174 coax. The volume and squelch pots are front-panel-mounted.

The easiest board to construct is the modulator board (see Fig. 2). The input is taken from the audio output chip in the receiver. On receive, this line is shorted to ground, causing the modulator to be disabled. The gain pot provides audio voltage to the diode clipper, which clips the audio peaks to approximately 1.2 volts p-p. The deviation pot selects which portion of this clipped audio is to be applied to the vco. This provides for direct FMing of the transmitter.

The third board is the frequency selector board. There are three controls on the front panel. There are two single-pole, 10-position switches, 29.50-29.59 and 29.60-29.60 MHz. There is also a three-position toggle switch (SPDT C-O), used so that either 29.50-29.59 MHz simplex, 29.60-29.69 MHz simplex, or 29.50-29.59 transmit and 29.60-29.69 MHz receive can be selected. The last combination is for repeater offsets.

A look at the frequency selector board circuit (see

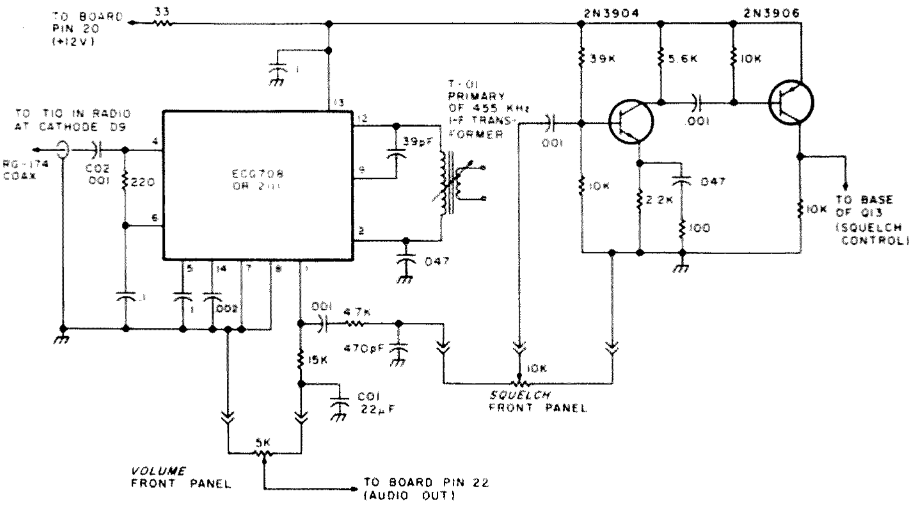


Fig. 1. FM detector/squelch board. Capacitors are in uF, 25 volts disc ceramic unless otherwise noted. Resistors are ¼ W.

Fig. 3) shows a diode matrix and a two-transistor circuit. The two transistors select which of the two single-pole, 10-position switches gets the 5 volts. The switch that gets the 5 volts is the switch that is active for frequency selection.

The steering for this circuit comes from board pin 12, which is operated by the PTT. This pin is high on receive and low on transmit. This is what happens: With the SPDT C-O switch in the center-off position, the 29.60-29.69 selector gets the 5 volts on receive and the 29.50-29.59 on transmit. By switching the SPDT C-O switch to one of the two other positions, the switching from pin 12 is disabled and locks up to a certain 10-position switch in transmit and receive.

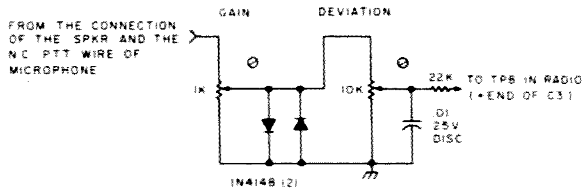
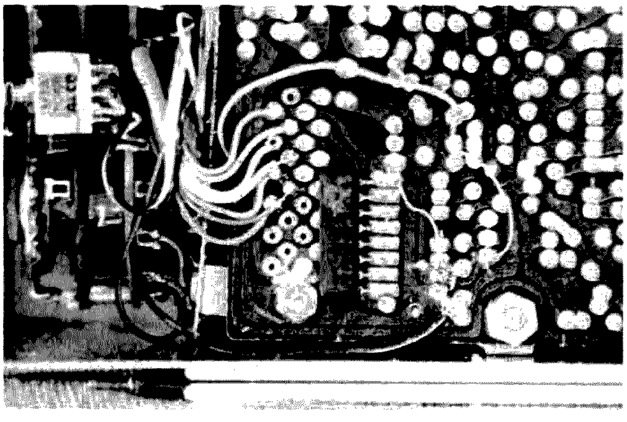


Fig. 2. FM modulator board.

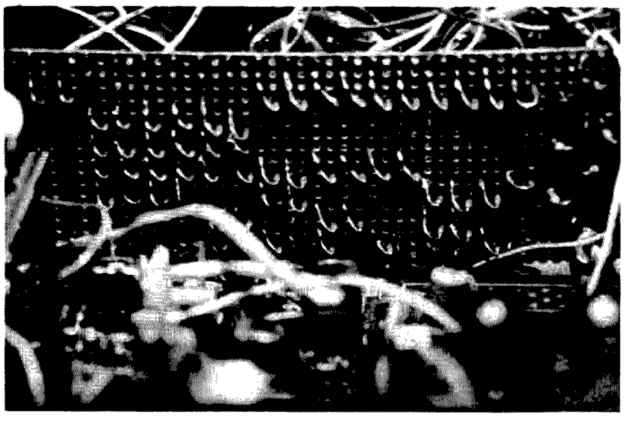
The diode matrix programs the PLL-02 IC in the radio. On the right of the frequency selector circuit are the binary weight values for the PLL-02 IC, along with the pins to which the wires must be connected. Along the top are listed the total binary weighting values for the various switch positions. Next to the switch positions are the last two digits of the operating frequency. The 5 volts to operate this circuit is brought from a 5-volt regulator which is part of the Hy-Gain board.

Construction

First, a few modifications to the Hy-Gain board must be done. Connect board pins 38 and 39 together. Re-



A close-up of the PLL-02 IC. The thick wires go to the frequency selector board, and the thin wires are the circuit changes made to the PLL-02 circuit.



A close-up view of the frequency selector board, showing how the diodes are installed and the 20 bare wires that go to the selector switches.

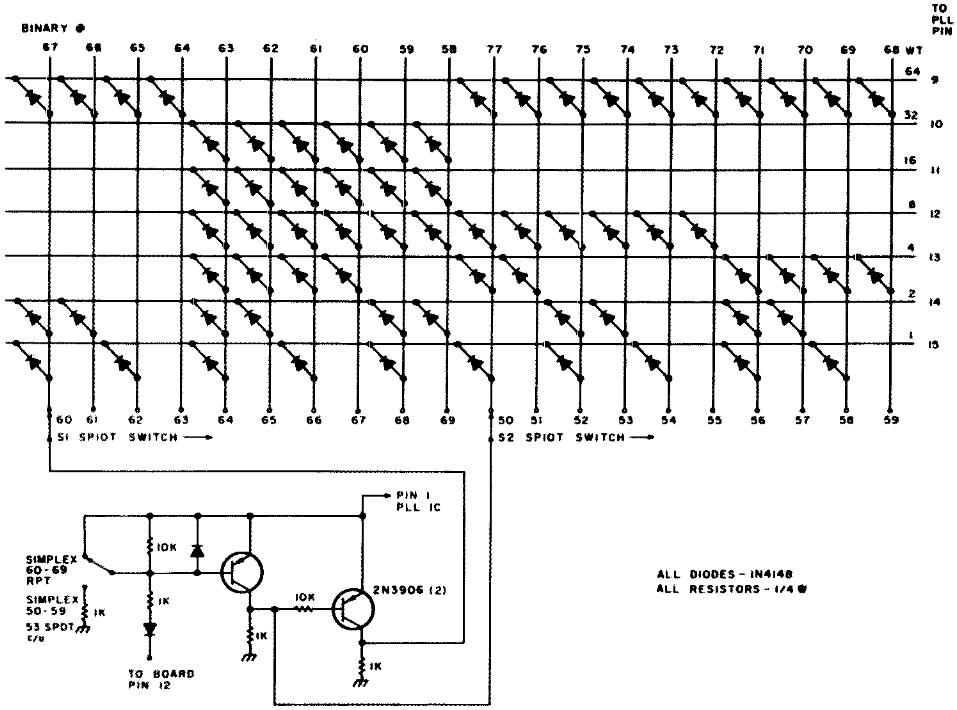


Fig. 3. Frequency selector board.

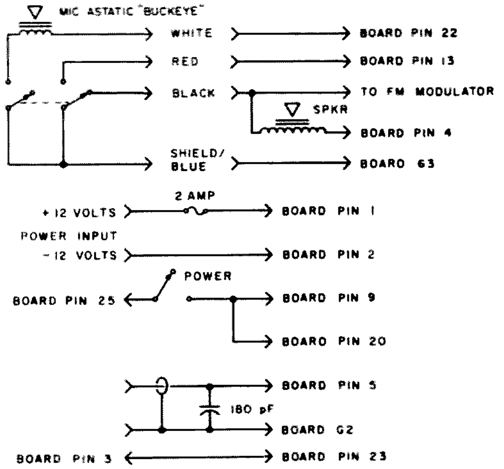


Fig. 4. Other hookups.

move R69, R71, D13, RV2, and C12. Connect a wire from board pin 20 to where the cathode of D13 was. To modify the PLL chip wiring, first isolate PLL IC pin 7 from the original wiring. Connect PLL IC pin 7 to PLL IC pin 8. Run a wire from PLL IC pin 1 to jumper J4. The other connections to the board are shown on the schematics. The three boards are made from .1"-spacing perfboard.

To make the diode matrix, on one side of the perfboard string 7 bare wires 4.5 inches (11.3 cm) across on one side. On the other side, string 20 bare wires perpendicular to those on the other side. Be sure to skip a row of holes between each string of wires. Then the diodes can be placed with one lead bent over in through the holes and soldered.

The FM detector can be mounted to the square hole above the BA521 IC with a small angle bracket. The modulator perfboard can be glued against the side of vco coil L1, being sure that nothing interferes with the tuning of the coil. The frequency board can be mounted across the front of the CB board, standing up vertically.

Tuning

For tuning, you will need a dc voltmeter, an rf probe, a signal generator (or a weak signal from an amateur transceiver), a frequency counter, and a General Cement model 9440 tuning tool.[3] A small hex head plastic tuning tool is also handy. Nothing ruins a powdered iron slug faster than trying to tune up with a regular screwdriver.

First, set the transceiver on 29.60 MHz simplex. Place a dc voltmeter on pin 6 of the PLL-02. Carefully tune vco coil L1 until 5 volts or so is reached. Move the voltmeter to pin 5 of the PLL-02. Carefully adjust vco coil L1 for 2.5 volts.

Next, attach a dummy load to the antenna jack. Place the rf probe on the base of Q3 (rf predriver). Adjust T1, L2, T2, L5, and T3 for maximum rf. Then move the rf probe to the antenna jack and adjust L7, L11, and L12 for maximum. Place the frequency counter on the antenna jack, and the counter should read 29.600 MHz. If the reading is a few kHz off, adjust trimmer CT1. If the reading is unstable, check the vco tuning. Run through all channels and see how each frequency looks. If an error shows, check the matrix and associated wiring.

Now, on receive, place the dc voltmeter on board pin 39 and adjust T5, T6, L14, T7, T8, T9, and T10 for maximum. Be careful not to overload. Adjust the quadrature coil on the FM detector/squelch board, with no signal, for maximum noise. Later tune when listening to another FM signal for best sound.

As a building hint, the housing for this radio can be built from aluminum. The box size is 6" (15.24 cm) by 8.5" (21.6 cm) by 2.5" (6.25 cm). Two U-shaped pieces of metal make up the top and bottom covers which fit over the ring of metal which makes up the main chassis.

That's it. Just look at the way I constructed it. As they say in the old country, "Ein Bild sagt tausend Worte."[4] I would like to thank Bob Russo WB2BMM for taking the photos shown here. If I can be of further help, please write, include an SASE, and I will try to help. ■

References

1. Knickerbocker K1DCS, Weise N1XN, Stielau W1WRO/N2XN, "CB on 10 FM—best conversion yet?", *73 Magazine*, January, 1980, p. 117.
2. Surplus Electronics Corp., 7294 NW 54 St., Miami FL 33166.
3. General Cement Electronics, Rockford IL 61101, or from your electronics parts distributor.
4. "A picture is worth a thousand words."

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MATERIALS

Send to Advertising Department, *73*, Elm Street, Peterborough NH 03458.

DRESS UP YOUR CLUB! Jackets, tee-shirts, hats, sportshirts, etc., with your logo or we'll custom design. Wavelength Productions, 20-22 120th St., College Point NY 11356. BNB048

FREE SAMPLE—send stamp. Buy/sell radio, computer equipment in "Electronic Exchange," Box 486E, Forest Lake MN 55025. BNB049

DEALERS IN SURPLUS TEST INSTRUMENTS, microwave equipment, and components. Wanted: Late test equipment (H.P., Tek, G.R., Narda, etc.), waveguide/coax components. Immediate needs: H.P. K382A, R382A, S382C, 432A, 6522A, 415E, G.R. 874- and 900-series coax items, G.R. 1633, 1863, 1864. Request want list. Lectronics, 1423 Ferry Ave., Camden NJ 08104; (609)-541-4200. BNB050

HELP! Cleaning garage—test eqpt., 6m and 2m FM gear, tubes, 1000s of service manuals for all makes and models of commercial FM xceivers 1975 and older. Reasonable prices. Send SASE for list. Tom McLaughlin WB4NEX, PO Box 411, Mango FL 33550; (813)-681-9709. BNB051

WANTED—your unused Teletype™ repair parts. High prices paid! Send SASE for list of Teletypewriter parts and supplies. TYPETRONICS, Box 8873, Fort Lauderdale FL 33310; (305)-583-1340 after 9:00 pm. N4TT. BNB052

WANTED: Old bugs for my telegraph and radiotelegraph key collection. I am trying to find each make and model of bug manufactured before 1950. Vibroplex, Martin, McElroy, Bunnell, Mecograph, MacDonald, D & K, Warner, etc. Also looking for Spark keys, Boston keys, cooties, sideswipers, and large or unusual radiotelegraph keys. 73 de Neal McEwen K5RW, 1128 Midway, Richardson TX 75081; 1-(214)-234-1653. BNB053

ON MARCH 11, 1984, the Morgan County Repeater Association Club will sponsor the Martinsville Hamfest at the Indiana Fairgrounds Pavilion Building in Indianapolis. Dealers, vendors, forums, and free paved parking. Doors open to the public at 8:00 am. Table reservations: Aileen Scales, 3142 Market Place, Bloomington IN 47401. BNB039

WYOMING-UTAH RANCH LAND. 10 acres, $60 down, $60/month. FREE information, maps, photographs. Trade equity for ham gear, home computer, test equipment, etc. Owner—Mike Gauthier K6ICS, 9550-B—Gallatin Rd., Downey CA 90240. BNB001

MOBILE IGNITION SHIELDING. Free literature. Estes Engineering, 930 Marine Drive, Port Angeles WA 98362. BNB006

QSL MANAGER ALBUM™. Beautiful leather-grained vinyl ring binder for displaying 240 of your prized QSL cards. 30-day guarantee. $18.95 ppd or send stamp for flyer. Walter Beaton WD8DVX, 3780 Cecilia Ave., Cleveland OH 44109. BNB009

WANTED: Early telegraph instruments for my collection. Keys, sounders, call boxes, registers, meters, and related items including pre-1910 paper. Larry Nutting WD6DTC, 5957 Yerba Buena, Santa Rosa CA 95405. BNB018

COLOR COMPUTER owners—call (212)-441-2807 for FREE color computer hardware and software catalog or write to Spectrum Projects, 93-15 86 Drive, Woodhaven NY 11421. BNB023

FOURTH ANNUAL Ohio State Convention and Flea Market: Join in the even bigger "Cincinnati ARRL '84," February 25 and 26. Activities for hams and electronics enthusiasts: forums, meetings, vendors, Wouff Hong, women's activities, banquet, hospitality suite, more. Sure cure for "cabin fever." Hospitality suite Friday and Saturday nights. The $5 convention registration includes all convention awards. Flea market is $4/space for two days—ham and electronics items, only. Write: Cincinnati ARRL '84, POB 11300, Cincinnati OH 45211 or telephone (513)-825-8234. Vendor and exhibitor inquiries invited. BNB024

WANTED: Cash paid for used SPEED RADAR EQUIPMENT. Write or call: Brian R. Esterman, PO Box 8141, Northfield IL 60093; (312)-251-8901. BNB030

RTTY FDM DEMODULATORS. FDM RTTY exists on satellites, **FM SCA** broadcast subcarriers (e.g., Commodity News Service), and HF radio. Four solid-state synthesized models, NSA surplus, new-used, $50 to $350. Call/write for brochure. Electrovalue Industrial, Inc., Box 376-WF, Morris Plains NJ 07950; (201)-267-1117. BNB032

SPECIAL NOTICE—Buy and sell your amateur equipment, computers, and video equipment on our national computer system that you access from your home, etc. Ads are updated daily. Low cost is only $15.00 per year for unlimited access 24 hours a day. For details, send SASE. NARWID ELECTRONICS, 61 Bellot Road, Ringwood NJ 07456. BNB037

TRS-80 1/3/4 RTTY/ASCII/MORSE. Free specs. Software and hardware schematic, $24.95 postpaid. KCQ Software, 6319 Boeuf Trace, Alexandria LA 71301. BNB038

ON MARCH 11, 1984, the Morgan County Repeater Association Club will sponsor the Martinsville Hamfest at the Indiana Fairgrounds Pavilion Building in Indianapolis. Dealers, vendors, forums, and free paved parking. Doors open to the public at 8:00 am. Table reservations: Aileen Scales, 3142 Market Place, Bloomington IN 47401. BNB040

FOR SALE OR TRADE: Swan 100MX 5-band solid-state transceiver and ac PS and Heathkit SB-201 amplifier, $325 each. Wanted: CW transceiver. W7LHO, (505)-471-6377. BNB041

BUMPER STICKER—"My Favorite Radio Station is (your callsign)." Display anywhere! Great gift idea. Only $3. Arpress, Dept. ST, 1556 Hicks Pike, Walton KY 41094. BNB042

PRINTERS: LA36 Decwriter II with keyboard, variable-width paper, etc., $325. CDI 1030 with keyboard, built-in modem, $125. W9QH, 11209 Hwy. U, Wausau WI 54401. BNB043

WWV RECEIVER, $35. Rf signal generator, 60 kc to 60 mc, $35. Hickock tube tester, $30. Audio signal generator, $35. K6KZT, 2255 Alexander, Los Osos CA 93402. BNB044

MILITARY TECHNICAL MANUALS for old and obsolete equipment. 60-page catalog, $3.00. Military Technical Manual Service, 2266 Senasac Ave., Long Beach CA 90815. BNB045

RUBBER STAMPS: Name, call, and address. $3.75 postpaid, US. Floyd Durand W5YZC, PO Box 67, Westwego LA 70094. BNB046

DX HIDDEN ASSET LOOP ANTENNA. Get on the air, comply with no-visible-antenna rules, from most indoor locations. Inexpensive, easy-to-build antenna couples directly to 50-Ohm coax; no antenna matcher required. Omnidirectional with vertical, bi-directional with horizontal polarization. Vswr typically 1.2:1 at resonance; useful bandwidth 3 to 5 percent of resonant frequency. Plans and instructions, $12.50 postpaid. H. Stewart Designs, PO Box 643, Oregon City OR 97045. BNB047

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

TRAVERSE CITY MI
FEB 11

The Cherryland Amateur Radio Club will hold its 10th annual swap and shop on February 11, 1984, from 8:00 am to 1:00 pm, at the Immaculate Conception School Gym, 2 blocks south and 1 block west of the intersection of M-37 and M-22, Traverse City MI. Registration will be at the door. Talk-in on 146.25/.85. For more information, call Jerry Cermak K8YVU at (616)-947-4848.

MANSFIELD OH
FEB 12

The Mansfield Midwinter Hamfest/Auction will be held on Sunday, February 12, 1984, beginning at 8:00 am, at the Richland County Fairgrounds, Mansfield OH. Tickets are $2.00 in advance and $3.00 at the door. Tables are $5.00 in advance and $6.00 at the door. Half tables are available. Talk-in on 146.34/.94. For additional information or advance tickets and tables, send an SASE to Dean Wrasse KB8MG, 1094 Beal Road, Mansfield OH 44905, or phone (419)-589-2415.

MELVILLE NY
FEB 19

The Long Island Mobile Amateur Radio Club will hold the LIMARC Indoor Hamfair '84 on February 19, 1984, from 0900 to 1600, at the Electrician's Hall, 41 Pinelawn Road, Melville NY. Admission is $3.00 each for everyone. Table reservations are $10.00 each, payable in advance to Bob Reed WB2DIN, 2970 Valentine Place, Wantagh NY 11793. Food and refreshments will be available. Talk-in on 146.25/146.85 (W2VL/R) or 146.52 simplex. For additional information, contact Al Flapan WA2FBQ at (516)-796-2965 or Hank Wener WB2ALW at (516)-484-4322.

LANCASTER PA
FEB 19

SERCOM, Inc., and the Red Rose Repeater Association will sponsor the 1984 Lancaster Hamfest on Sunday, February 19, 1984, from 0800 to 1600, at the Guernsey Sales Pavilion, US Routes 30 and 896, Lancaster PA. General admission is $3.00 for all hams and dealer personnel; tailgating is free with general admission, weather permitting. Commercial tables (main hall) are $15.00 and noncommercial tables (rear annex) are $6.00. Talk-in on 146.61 and 147.015. For reservations, send a check payable to SERCOM, Inc., to Hamfest Committee, PO Box 6082, Lancaster PA 17603.

ELKIN NC
FEB 19

The seventh annual Elkin Winter Hamfest will be held on Sunday, February 19, 1984, at the Elkin National Guard Armory, located two miles off Interstate 77 at Exit 85 in Elkin NC. Doors will open to the public at 0830, and breakfast and lunch will be served at the hamfest by the Foothills ARC of Wilkesboro NC and the Briarpatch ARC of Galax VA. Talk-in on 144.77/145.37, 146.22/.82, and 147.69/.09. For table reservations (which are limited) or other information, contact either George Reeves WD4BMG, Route 6, Box 412, North Wilkesboro NC 28659, (919)-670-2803, or Tommy Lineberry WD4BTF, 308 Poplar Street, Galax VA 24333, (703)-236-8424.

GLASGOW KY
FEB 25

The annual Glasgow Swapfest will be held on Saturday, February 25, 1984, beginning at 8:00 am Central time, at the Glasgow Flea Market Building, 2 miles south of Glasgow, just off highway 31E. Admission is $2.00 per person. There is no additional charge for exhibitors. The first table per exhibitor will be free, and extra tables will be available for $3.00 each. There will be a large heated building, free parking, free coffee, and a large flea market. Talk-in on 146.34/.94 or 147.63/.03. For further information, write Bernie Schwitzgebel WA4JZO, 121 Adairland Court, Glasgow KY 42141.

FRIDLEY MN
FEB 25

The Robbinsdale Amateur Radio Club will hold its 3rd annual Midwinter Madness Hobby Electronics Show on Saturday, February 25, 1984, from 9:00 am to 3:00 pm, at Totino-Grace High School, 1350 Gardena Avenue NE, Fridley MN (a Minneapolis suburb). Admission is $3.00 in advance and $4.00 at the door. There will be manufacturers and dealers of ham, computer, satellite, and R/C gear, as well as seminars and a flea market. Talk-in on 146.52 simplex or the 147.60/.00 repeater (KØLTC). For more information, contact Robbinsdale ARC, PO Box 22613, Robbinsdale MN 55422, or call Bob at (612)-533-7354.

AKRON OH
FEB 26

The Cuyahoga Falls ARC will hold its 30th annual electronic equipment auction and hamfest on Sunday, February 26, 1984, from 8:00 am to 4:00 pm, at North High School, Akron OH. There is easy access from the Tallmadge Avenue off-ramp of North Expressway (Rte. 8). Tickets are $2.50 in advance and $3.00 at the door. Some tables are available for $2.00 or sellers may bring their own; advance reservations are advised. Talk-in on .87/.27. For more details or reservations (please include an SASE), write CFARC, PO Box 6, Cuyahoga Falls OH 44222. Table reservations may also be made by calling Bill Sovinsky K8JSL at (216)-923-3830 and will be held until 9:00 am.

EGG HARBOR CITY NJ
MAR 10

The Shore Points Amateur Radio Club, Inc., will hold the Springfest '84 on Saturday, March 10, 1984, from 9:00 am to 4:00 pm, at the Atlantic County 4-H Center, Egg Harbor City NJ (approximately 15 miles west of Atlantic City). Admission for buyers is $2.50 in advance and $3.00 at the door; sellers' space is $5.00 (bring your own table). There will be 8,000 square feet of heated indoor selling space, and covered tailgating will be available, weather permitting. For more information, write SPARC, PO Box 142, Absecon NJ 08201.

INDIANAPOLIS IN
MAR 11

The Morgan County Repeater Association Club will hold the Martinsville Hamfest on March 11, 1964, indoors at the Indiana State Fairgrounds Pavilion Building, Indianapolis IN. Admission is $4.00 at the door. Premium tables are $30.00 each, flea-market tables are $8.00 each, and flea-market space without a table is $1.00. All tables must be reserved in advance and setup will be Saturday, March 10, from 1:00 pm to 9:00 pm. Space setup will be Sunday, March 11, from 6:00 am to 8:00 am. There will be free paved parking. Talk-in on 147.21 and 146.52 simplex. For more information or table reservations, send an SASE to Aileen Scales KC9YA, 3142 Market Place, Bloomington IN 47401 before March 1.

WINCHESTER IN
MAR 11

The Randolph Amateur Radio Association will hold its 5th hamfest on Sunday, March 11, 1984, from 8:00 am to 5:00 pm, in the National Guard Armory, Winchester IN. Ticket donation is $3.00 and children under 12 years old will be admitted free. Table space (by reservation only) is $5.00 with a table and $2.50 without. There will be a flea market, dealers, programs, food, and drink. Setups will be on Saturday from 6:00 pm to 8:00 pm and on Sunday from 6:00 am to 8:00 am. Talk-in on 147.90/.30, 224.90/223.30, and 146.50. For reservations and more information, contact RARA, Box 203, Winchester IN 47394, or phone Jake Life W9VJX at (317)-584-9361.

MIDLAND TX
MAR 17-18

The Midland Amateur Radio Club will hold its annual St. Patrick's Swapfest on Saturday and Sunday, March 17-18, 1984, at the Midland County Exhibit Building, east of Midland TX on the north side of Highway 80. The hours on Saturday are from 10:00 am to 6:00 pm and on Sunday from 8:00 am to 2:30 pm. Registration is $5.00 in advance and $6.00 at the door; tables are $6.00 each. Refreshments will be available. Talk-in on .18/.76 and .33/.93. For further information and reservations, please contact Midland Amateur Radio Club, PO Box 4401, Midland TX 79704.

DAYTON OH
APR 27-29

The 1984 Dayton Hamvention's International VHF/UHF Conference will be held concurrently with the Hamvention from Friday through Sunday, April 27-29, 1984, at the Hara Arena and Exhibition Center, Dayton OH. There will be technical forums by acknowledged experts; noise-figure, dynamic-range, and antenna-range measurement contests; and a hospitality suite with refreshments. Technical papers and presentations on VHF/UHF topics of interest are being solicited for consideration. Potential speakers should submit their requests immediately. For further information, contact Jim Stitt WA8ONQ, VHF/UHF Conference Moderator, 4126 Crest Manor, Hamilton OH 45011.

DAYTON OH
APR 27-29

The Dayton Amateur Radio Association, Inc., will sponsor the Dayton Hamvention on April 27-29, 1984, at the Hara Arena and Exhibition Center, Dayton OH. Admission, valid for all three days, is $7.50 in advance and $10.00 at the door. The Saturday evening Grand Banquet and Entertainment is $14.00 in advance and $16.00 at the door. Harry Dannals W2HD, past president of the ARRL, will be the featured speaker. Because seating is limited, early reservations are requested. There will be a giant flea market starting at noon on Friday and continuing all day Saturday and Sunday. Flea-market space is $15.00 for all three days and will be sold in advance only. Entrance for setups will be available starting Wednesday and the special flea-market telephone is (513)-223-0923. Other features will include forums, awards, and exhibits. For special motel rates and reservations, write Hamvention Housing, Box 1288, Dayton OH 45402; no telephone reservations will be accepted. Address all other inquiries to Box 44, Dayton OH 45401, or phone (513)-433-7720. Please send advance registration checks to Dayton Hamvention, Box 2205, Dayton OH 45401.

FCC

Reprinted from the Federal Register

Changes in Procedures for Approval of Proposed Antenna Structures in the Amateur Radio Service; Announcement of Effective Date and Correction

AGENCY: Federal Communications Commission.

ACTION: Final Rule; announcement of effective date and correction.

SUMMARY: The effective date of rules amending this document sets Parts 17 and 97 to change procedures for approval of proposed antenna structures in the Amateur Radio Service (2-5-81; 48 FR 10915). The rule amendments were adopted by the Commission on January 8, 1981, but their effective date has been held in abeyance pending clearance of reporting requirements by the General Accounting Office. The amendments are necessary to permit amateur radio operators to file a single form to obtain approval of proposed antenna structures, instead of the two forms (610 and 714) currently required. The effect of this action is a simplification of the antenna approval process for both amateur radio licensees and the Commission.

The antenna approval form number is 854.

DATE: The effective date of the rules changes is January 3, 1984.

In § 17.4(h), where there is a blank space following the word Form, insert the number 854. In § 97.45(a), where there is a blank space following the word Form, insert the number 854.

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

DX AWARDS FROM SWEDEN

The Bull Award

In order to make the province of Dalsland, Sweden, better known and to increase the activity of the amateurs in that region, the Melleruds Radio Club (SK6CM) decided to issue the Bull Award.

To qualify for this diploma, stations in Norway, Sweden, Finland, and Denmark must achieve 10 points, other European stations must achieve 5 points, and stations outside Europe must obtain 2 points credit. Every QSO with a radio amateur residing in Dalsland will give the applicant 1 point toward his or her goal. Should you have a QSO with SK6CM, 2 points will be credited to your total. All bands and modes will be allowed, but only one QSO with each station will count. All QSOs must be on or after January 1, 1979. Contacts via a repeater or satellite will not count.

Applications must list each callsign worked, date, time, GMT, band, mode, and the applicant's own name, call, and full mailing address. QSLs are not required. General certification rules apply. The award fee is 5 US dollars or 20 Swedish kroner. Send your application and award fee to Melleruds Radio Club, 464-00 Mellerud, Sweden.

As of April 25, 1979, the following amateurs would qualify for contacts to obtain this award: SK6CM, SM6s: AGW, ALJ, AMU, ASJ, AWZ, BER, BGG, BLE, BOT, BPX, CGI, CJK, CLX, CMK, CNC, COY, COZ, CQK, CUA, CWK, CYU, DKU, DXY, EOI, EPA, ESW, EUC, EUT, FCM, FFK, FLR, FNE, GAS, GDP, GMR, GQJ, HQZ, HRL, IHF, JJZ, JKB, JMA, JOD, JOG, JOM, JOO, JQA, JRB, JRY, JUJ, KFA, KFB, KFF, and ST.

The SWL Activity Club of Sweden and their award manager were very kind to send me complete award program information about the two major DX awards being offered by their organization.

Worked All Zone-14 Countries Award

This award is available to amateurs in three levels of achievement: Class A—work 27 countries in CQ Zone 14, Class B—work 22 countries in CQ Zone 14, and Class C—work 15 countries in CQ Zone 14.

There are no band or mode limitations, nor are there any date restrictions known at this time. Applications for WAZ14CA are sent with US$2.00 or 10 IRCs to SWL Club Activity, Fack 55, S-780, 40 Mockfjard, Sweden. GCR apply.

Countries in CQ Zone 14 are: CT1, CT2, C31, DA/DF/DJ/DK/DL, DM, EA, EA6, EI, F, G, GD, GI, GJ, GM, GU, GW, HB9, HB0, LA, LX, ON, OY, OZ, PA/PI, SL/SK/SM, ZB2, 3A, 4U (Geneva).

Worked ITU Zones 17/18 Award

This award is available to amateurs in three levels of operation: Class A—work all countries in ITU Zones 17/18, Class B—work 7 countries in ITU Zones 17/18, including TF (Iceland), and Class C—work 5 countries in ITU Zones 17/18.

Endorsements will be made available for single-band or -mode achievements. Applications must be sent to the SWL Club Activity with 10 IRCs or US$2.00. Mailing address is Fack 55, S-780, 40 Mockfjard, Sweden.

Countries located in ITU Zones 17/18 are: ITU Zone 17—TF; ITU Zone 18—JW, JX, LA, OH, OH0, OJ0/OH0M, OY, OZ, ZM.

Morokulien Award

Our good DX friend, Erland Belrup SM7COS, enlightened us with news about the charitable Morokulien (SJ9WL/LG5LG) activity in the unique "state" on the Norwegian-Swedish border, east of Oslo, featuring radio calls LG5LG and SJ9WL and a lot more.

Recognizing the independency of this area, the Morokullen activities have been stimulated to benefit the handicapped radio amateurs in Norway and Sweden. Likewise, applicants for the Morokulien Award find their donated award fees going to aid these less fortunate people . . . a cause all of us can be proud to have assisted.

This unique DX award is available to licensed amateurs and SWLs. Only contacts after July, 1968, will count. Applicants are asked not to send QSL cards. GCR apply. Europeans must contact LG5LG and SJ9WL on two bands and on different days for a total of four days of operation.

All other applicants must work each of these two stations, each on a different day.

You may forward your application to the attention of Ulf Strandberg LA2ZN, Konglev. 3, N-2200 Kongsvinger, Norway. Please be sure to enclose an award fee of US$3.00 or 8 IRCs. Additional contributions are most appreciated.

DX AWARD FROM ROMANIA

The Romanian Radio Amateur Federation takes pleasure in announcing the YO DX Club Award available to amateurs and SWL stations the world over.

YO DX Club Award

To qualify for the YODXC Award, applicants in Europe need to confirm contact with five YO DX Club members; stations outside Europe need confirm only two YO DX Club membership contacts. All QSOs must be made after August 23, 1949, and may be made on any mode or combination of modes and any band in the HF, VHF, or UHF segments.

To apply, have your list verified by at least two amateurs and send your list with US$1.00 or 7 IRCs to: FRR (YODXC), PO Box 1395, R 78100 Bucuresti 5, Romania.

As of January 1, 1978, the following YO DX Club members count towards this award:

YO2s: ABW, AVP, BA, BB, BN, BS, BU, BV, CD, FP, GL, GZ, IS, KAB, KAC, KAR, OY, RA, VB, VF.

YO3s: AAJ, AAQ, AC, AVE, BAA, CR, DZ, FF, FU, JF, JU, JW, KAA, KBC, KSD, NN, OK, QO, RD, RF, RG, RK, RO, RX, VN, YZ.

YO4s: ASG, CS, CT, HW, KAK, KBJ, KCA, WO, WU, XF.

YO5s: AFJ, AMO, ATV, AUG, AVN, AY, BW, DS, KAD, KAU, KLA, LC, LD, LP, NB, NU, NZ, UW.

YO6s: ADM, AW, EX, KAF, KAL, KBA, KBM, LG, UX, XI.

YO7s: BI, DL, DO, KAJ, NA, NM, VS.

YO8s: AGZ, CF, DD, FZ, GF, KAE, KAN, KGA, ME, MH, OK, OP, RL.

YO9s: APJ, ASS, BGV, CN, EM, GP, HH, HI, HT, IA, IF, KAG, KPD, VI, WL.

YO0s: ITU, YROA.

In YO-land, the suffix for the same licensed ham is the same for any prefix.

DX AWARDS FROM THE RADIO CLUB OF PARAGUAYO

The All Mediterranean Countries Award

The AMCA is given for confirmed contacts with Mediterranean countries in three levels of achievement: Class A—41 countries, Class B—30 countries, and Class C—20 countries. A ZP contact is obligatory in any class of award. The following prefixes qualify as valid contacts: A2, A5, AC3, C31, CP, HA, HB, HB0, HV, JT, LX, OE, OK, TL, TT, TZ, UC2, UD6, UG6, UH8, UI8, UL7, UM8, UO5, XT, XW8, YA, ZE, ZP, 3D6, 4U1, 5U7, 5X5, 7P8, 7Q7, M1(9A), 9J2, 9N1, 9U, 9X.

All Zone 11 Prefix Award

The AZ11PX Award is given for confirmed contacts with prefixes in CQ Zone 11 as follows: Class A—30 prefixes, Class B—19 prefixes, and Class C—12 prefixes.

ZP1 to ZP9, PY1 to PY0, and the special prefixes used for WPX contests are the only prefixes which qualify for this very difficult award.

The Tropics of Cancer and Capricorn Award

The TCCA Award is afforded to those applicants who confirm contacts with countries touched by the Tropics of Cancer and Capricorn boundaries. A ZP contact is obligatory for this award. For Class A, 28 country contacts are required from the list below. Class B requires 20 countries; Class C requires 12 countries. The following prefixes qualify as valid contacts:

Tropic of Cancer: S2/3, BV, BY, EA9, KH8, A4, A6, SU, TZ, C6, VU, XE, XZ, 5A, 5T5, 5U7, 7X, 7Z.

Tropic of Capricorn: A2, CE, C9, LY, PY, VK, ZP, ZS, ZS3, 5R8.

The Diploma Sud-America

The DSA Award is given for contacts with countries located in ITU Zones 12, 13, 14, 15, 16, and 73 as follows: Class A—33 DX countries and 6 ITU zones, Class B—25 DX countries and 6 ITU zones, and Class C—18 DX countries and 5 ITU zones.

Countries which are qualifying contacts are:

Zone 12—FY, HC, HC8, HK, HK0 (Malpelo), OA, PZ, 8R, YV, CP1/8/9.

Zone 13—PY8/7/8, PY0 (Fernando de Noronha), PY0 (St. Peter, St. Paul).

Zone 14—CE1/2/3/4/5, CE0X, CE0Z, CP2/3/4/5/6/7, ZP, CX, LU-A/U/Y.

Zone 15—PY1/2/3/4/5/9, PY0 (Trinidad Island).

Zone 16—CE6/7/8, VP8 (Falkland), LU-V/W/X.

Zone 73—KC4USP, LU-Z, CE9AA/AM, VP8 (Graham Land), VP8 (Georgia), VP8 (So. Orkney), VP8 (So. Sandwich), VP8 (So. Shetland).

Diploma Paraguay

The DP Award is given for confirmed contacts with five different ZP stations. Stations in South America are required to contact 15 ZP operators.

Worked All ZP

The WAZP Award is being offered to amateurs making at least one confirmed contact with ZP stations in each of the ZP call districts, ZP1-ZP9.

Diploma Departmentos Del Paraguay

The DDP is given for confirmed contacts with the nation's capital and different departments into which Paraguay is divided. Class A requires 20 contacts; Class B requires 16 contacts; Class C requires 12 contacts.

Departments by prefix are: ZP1—Boqueron, Chaco, Nueva, Asuncion; ZP2—Altos, Pte. Hayes; ZP3—Amambay, Concepcion; ZP4—Canendiyu, San Pedro; ZP5—Asuncion (nation's capital); ZP6—Central, Cordillera, Paraguari; ZP7—Caaguazu, Caazapa, Guaira; ZP8—Misiones, Neembucu; ZP9—Alto Parana, Itapua.

Contacts must be made on or after May 15, 1952, to qualify for any of the awards sponsored by the Radio Club of Paraguay. A certified list of contacts with a fee of 5 IRCs for each award should be sent to: Elio Donna ZP5CE, Award Manager, RC Paraguayo, PL Box 512, Asuncion, Paraguay.

3905 CENTURY CLUB AWARDS

Representing the 3905 Century Club, Bill Herbert WA2ZYM writes to share with us the various awards available to amateurs who frequent their net operation.

The 3905 Century Club is basically a WAS (Worked All States) net which grew out of the old Bicentennial Net on 80 meters back in 1976. The net now operates daily on 40 and 80 meters, 0100-0500Z on 7.233 MHz and 0500-0800Z on 3.905.

Naturally, as time went on, it became apparent that an awards program of some kind was in the offing. As amateurs work each other on the band, they gather a point per contact. Once 100 points are earned, you become a full-fledged member of the club and are issued a certificate to illustrate your affiliation.

As members continue their contacts on the net, several levels of achievement are recognized, with the ultimate being the 1,000-Point Award, which is certainly no overnight venture.

Among the certificates afforded net participants is the 3905 Century Club State Capitals Awards, which requires the applicant to contact at least 35 state capital cities. Endorsements are given for 40, 45, and the maximum of 50 state capitals worked on the sponsor net.

HAROAA AWARDS

We believe the many long hours of dedicated operation should not go unnoticed, nor should the high degree of enthusiasm of amateur-radio operators go neglected in their pursuit of self-set goals. That is why we have an awards column in this magazine and why I introduce to you the awards and certificates made available by HAROAA.

As we review each one individually, we find that all their awards are of high quality and will make a very impressive addition to any radio shack.

GCR apply in making application for HAROAA Awards. Each award is two dollars or 5 IRCs. At your request, special endorsements will be added for CW, SSB, RTTY, SSTV, FM, QRP, All YL, or single band. There is no date restriction on contacts made and satellite contacts are permitted.

HAROAA DX Award

For this, the most popular of all HAROAA achievement awards, the applicant is awarded recognition for contacting 10 DX stations. Endorsements are also given for 25, 50, 75, 100, 200, and 500 DX

contacts. Keep in mind we are not speaking of DX countries, but instead, DX "contacts," which makes this award unique.

Great Lakes Award

This award requires one contact from each state bordering the Great Lakes: New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, and Minnesota.

Insomnia Award

This award is earned for communicating with a single amateur station anywhere in the world for a minimum of one hour between the hours of 1:00 and 5:00 am. Truly a super conversation piece for any ham shack.

Super Certificate Hunters Award

This award is designed for the serious certificate hunter. To earn this award, you must have a minimum of ten amateur-radio awards in your possession. Simply list these awards on your application and note the certificate number of each. Special endorsements are given for your collection of 25, 50, 75, 100, and 100 plus.

Official Traffic Handler Award

This award is a self-issued achievement, allowing you to display the fact that you are indeed an official handler of radio traffic.

HAROAA Super Operator Award

This certificate is rendered for those providing a service on behalf of amateur radio, such as weather observer, public service, emergency, helping a new ham, providing communications for a community function, etc. The requirements are for the applicant to briefly describe the event of service. The officials at HAROAA will determine whether it deserves this special recognition.

For your personal copy of HAROAA award program rules or to apply for any awards presented here, write: HAROAA Award Program, PO Box 341, Hinckley OH 44233.

NORAC WINTER CARNIVAL

The North Okanagan Radio Amateur Club will have a special station set up during its Winter Carnival (western Canada's largest). This is a free award but we would sure appreciate $1.00 or 2 IRCs to cover the postage. The award is available to all amateurs worldwide who contact 3 Vernon area stations or QSO once with our club station VE7NOR; any mode or band is permissible. Our special station will be operating daily from February 1 until February 12, 1984. Times will be from 2100Z to 2430Z. Look for us in the General portion of each band, about 50 kHz up, calling "CQ Winter Carnival Award."

SCHOLARSHIP HONORS SENATOR GOLDWATER

In Washington DC on November 9, Senator Barry Goldwater (R-Arizona) announced to his fellow ham-radio operators around the world that the American Radio Relay League had established an annual $5,000 scholarship award in his honor.

The League will award the scholarship to a licensed radio amateur enrolled in college-level study of electronics, communications engineering, or a related field. The program will be administered by the ARRL Foundation, Inc., the League's tax-exempt research and educational organization.

Goldwater, known to thousands of radio amateurs as K7UGA, made the announcement from his "ham shack" on Capitol Hill. Within seconds after the ceremonial transmission, Goldwater began receiving congratulatory messages from ham operators throughout the US and several foreign countries.

The late Vic Clark, League president, explained that Goldwater was selected as honoree for the organization's new scholarship because his "selflessness and dedication to purpose as a government servant is widely recognized and deeply appreciated by both his fellow citizens and the radio amateurs of our country."

"Through his amateur-radio involvement, Senator Goldwater has brought joy to thousands of members of our armed services," Clark said, recalling that the Arizona senator opened his radio facilities for around-the-clock operations during the Vietnam War to provide a communications link between US military personnel in Southeast Asia and their families.

Goldwater, whose interest in amateur radio dates back to his teenage years, said the value of ham operators has been demonstrated repeatedly in times of local or national emergency.

The recent Grenada mission is a case in point. Practically no normal communications were available to the public. Ham-radio operators quickly opened links with the Caribbean island, particularly handling messages relating to the safety of several hundred American students at St. George's College. It was through these amateur channels that the press and public received most of their information during the early days of the mission.

For a brief while, Americans were once again reminded of the important role played by radio amateurs. More often, though, the crucial contribution made by ham-radio operators has become "so commonplace that it often goes unnoticed and uncredited," Goldwater said.

Information about the scholarship program can be obtained from the ARRL Foundation, 225 Main St., Newington CT 06111.

HAM HELP

I need schematics and manuals for the Hallicrafters S77 communications receiver, Heathkit HR-10 receiver, and Johnson Viking II transmitter. Thank you.

Shawn Jerin
4-710 West Leila Ave.
Tampa FL 33616

Has anyone had any trouble building the "Down-Under Depth Sounder" (July, 1983)? Mine won't work.

C. G. Wortham N9AKD
28 W. 559 Rogers Ave.
Warrenville IL 60555

I wonder if anyone has a parts catalog so that us old-timers can find radio and ham gear such as transformers, coils, chokes, and hard-to-find tubes.

Clarence L. Frady
1207-A Old 70 West
Black Mountain NC 28711

Needed: schematic for a DSI counter, Model 5600A. Happy to pay reproduction costs.

John E. Greve
4211 7th Ave.
Rock Island IL 61201

CORRECTIONS

Two errors crept into recent issues. In November (page 103), we inadvertently listed DA1TN as the third-place DX multi-op finisher in the 1983 40m World SSB Championship. The correct callsign is DA1US.

Also, in "Idiot Buzzer for the 1978 Honda Civic" ("Circuits," December, page 99), the bottom three diodes are reversed.

Jack Burnett
Executive Editor

✓ See List of Advertisers on page 98

NEW PRODUCTS

TC-1 PLUS ATV TRANSMITTER/ DOWNCONVERTER

P. C. Electronics has upgraded their TC-1 all-in-one-box 420-450-MHz full-color ATV unit with some new features. The new unit is called the TC-1 Plus. With more and more amateurs using computers and VCRs on ATV, separate video and audio inputs were added to the existing camera and mike inputs. This allows front-panel switching back and forth between the camera and computer, or transmitting the VCR audio along with voice-over commenting using a microphone. It has made learning Basic computer language over the air and retransmitting the Space Shuttle video and audio easy.

Capability for external 13.8 V dc has been added to the built-in ac supply for those who want to go mobile or portable on battery power during Field Day, emergency services, CAP searches, parades, marathons, or other public-service events.

A video monitor output is now provided to enable seeing your own picture exactly as it is transmitted in order to better set modulation levels, lighting, etc. This is accomplished by the built-in diode detector on the transmitter rf power output stripline which then connects to the composite video-monitor line-driver circuit.

The TC-1 Plus has the new TXA5-5 exciter/modulator which features two-frequency plug-in crystal switching with just the addition of an SPST switch. Also, the bulletin sync stretcher and hi/lo power switch capability enable superior stable color video if a higher-power linear amplifier, such as the Mirage 100-Watt D1010N, is added later or run barefoot at its greater than 10 Watt PEP rf output.

The 420-450-MHz tunable downconverter has the low noise NE64535 preamp stage to dig out the weak signals. It acts like a super hot UHF TV tuner but covers only the 70cm ham band when connected to your TV set antenna input and set for channel 3 or 4. Both color video and sound live action ATV are available on your TV set just as the broadcast stations provide. The standards are the same.

With the TC-1 Plus, the only other items necessary to get on ATV are a good 70cm antenna and low-loss coax, your TV set, and any device with a standard low-voltage p-p composite video output commonly found on black and white CCTV cameras, home video color cameras and VCRs, computers, RTTY/video converters, etc. A Technician class or higher amateur-radio license is required for operation and purchase from P. C. Electronics.

For more information and a complete catalog of ATV equipment, antennas, cameras, modules, and accessories, call or write *P. C. Electronics, 2522 Paxson Lane, Arcadia CA 91006; (818)-447-4565.*

SOFTWARE PROTECTION SYSTEM

Software Protection Devices, Inc., a division of Wayne Green Enterprises, has introduced Copyrighter, a hardware-based protection system using encryption technology. The Copyrighter system has been proven by beta testing to provide pirate-proof software protection.

Software to be protected by Copyrighter is first encoded using a Data Encryption Standard (DES) algorithm which scrambles the machine code of the program. The customer, on the first use of the protected program, calls an 800 number and obtains a code which will unlock the program. The user types in this enabling number to decode the DES encryption and prepare it for use with the Copyrighter CPU (C-CPU).

The C-CPU is a standard CPU with a different decoder built into each unit. It is installed by a dealer on owned equipment or at the factory on new computers.

One C-CPU can be used to decode any number of protected programs, yet it will run unprotected software with no interference. This system does not slow down the CPU, even on protected programs. A protected program may be freely backed-up by the user on any medium and will run only on the user's computer.

Copyrighter software protection boundaries are flexible to allow the publisher to leave certain portions of their software, such as I/O routines, unprotected and modifiable by the user. All unprotected portions may be written in any programming language.

For more information, contact *Ken Witham* at *Wayne Green Enterprises, Inc., 80 Pine St., Peterborough, NH 03458; (603)-924-9471.* Reader Service number 480.

The System 70X satellite receiver from Lowrance Electronics.

SATELLITE RECEIVER

Lowrance Electronics of Tulsa, Oklahoma, has introduced a new satellite receiver for 1984. The new receiver unit, called the System 70, follows the firm's system 7 and will be manufactured at the company's headquarters in Tulsa. The receiver will be marketed through a worldwide distributor network.

The System 70 receivers feature detent tuning, polarity control, a signal-strength meter, built-in modulator, scan tuning, and wide and narrow audio filters. The receivers are available as the standard model 70X or the stereo version, 70S, which decodes both matrix and discrete stereo sound and features simplified stereo tuning. Both models carry a full one-year warranty.

For additional information, contact *Lowrance Electronics, Inc., 12000 E. Skelly Drive, Tulsa OK 74128.* Reader Service number 479.

NEW TRIBAND BEAMS

Palomar Engineers has announced the availability of two triband beams. Model DX-33 has three elements on 10, 15, and 20 meters. Model DX-43 has four elements.

These antennas have long been used by European DXers and are being made available in the US for the first time.

Designed for use with solid-state transceivers, the antennas feature low swr and wide bandwidth. Gain and front-to-back ratio are particularly good. Each trap is individually sweep tested at the factory for uniform performance. Stainless-steel U-bolts are used throughout.

For more information, contact *Palomar Engineers, 1924-F West Mission Road, Escondido CA 92025; (619)-747-3343.*

NEW SOFTWARE FOR THE TRS-80

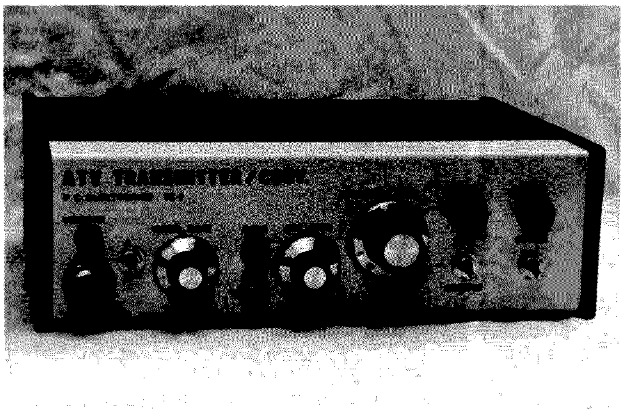
Woodall Software has announced a TRS-80 program for transmission and reception of RTTY that does not require a TV or interface for operation. The SOFTTY program will work as well or better than software/hardware packages requiring a PLL decoder. Only the much more expensive TUs may give consistently better results.

Gary Woodall has devised an algorithm for this program that samples the incoming audio signal to measure the tone frequency and shift using the cassette READ port. This method is very effective and makes the system immune to most noise. The only thing that may be a problem is other signals which are almost exactly on your operating frequency.

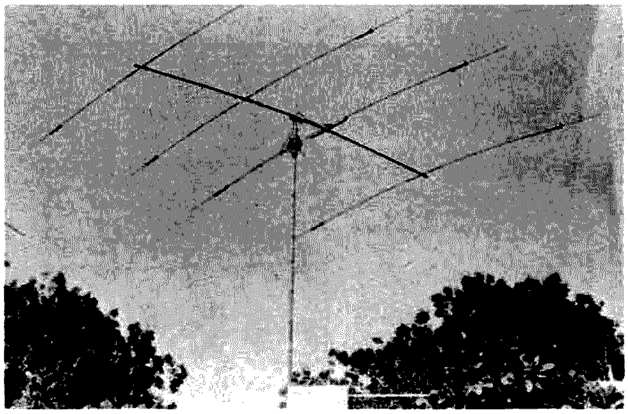
The program was written entirely in Z-80 machine language to obtain the processing speed necessary for the algorithm and associated functions. Timing is very critical and necessitated close attention to T states and M cycles during programming (down to micro-seconds).

The tone-generating section of SOFTTY simulates the two RTTY tones by producing an alternating time-controlled voltage and outputting via the cassette WRITE port. The output from the AUX plug is then fed into the microphone input circuit of the transmitter. Most mike input circuits will smooth the simulated sine-wave signal, making it sound like a true sine wave when transmitted.

SOFTTY Version 1.0 has split-screen



P. C. Electronics' ATV unit.



Triband beams from Palomar Engineers.

The IC-27A mobile unit from Icom.

The Icom IC-271H transceiver.

operation so that the main buffer may be filled while decoding and displaying the received signal. A choice of high and low toners is keyboard selectable, as well as normal and inverted (mark/space or space /mark) tone detection.

SOFTTY 1.0 is set for a 170-Hz tone shift used by amateur-radio operators. Other versions are available for different shifts used by news and weather services. A visual tuning indicator makes setup easy to accomplish.

There are five programmable buffers available, each of which can hold up to 255 characters. They can be filled from the keyboard and saved to magnetic tape for later retrieval.

For more information, contact *Bill Gouge or Gary Woodall at Woodall and Associates, PO Box 284, 11 Glenda Drive, Plainfield IN 46168; (317)-271-2565.* Reader Service number 481.

NEW FROM ICOM

Icom has introduced three new models of amateur equipment: the IC-27A two-meter 25-Watt mobile unit, the IC-04A and IC-04AT 440-MHz hand-held transceivers, and the IC-271H 100-Watt two-meter base-station transceiver.

IC-27A

The IC-27A is an important breakthrough in two-meter mobile communications. Measuring 1-1/2 inches high by 5-1/2 inches wide, the IC-27A contains an internal speaker making it easy to mount.

Although the IC-27A is compact, it has not sacrificed any features. Standard features include 25 Watts of output power, 32 PL™ frequencies, ten full-function tunable memories, scanning of memories and the band, priority scan, and a microphone which includes a 16-button touchtone™ pad for access to a repeater or dialing through to an autopatch. An optional speech synthesizer also is available to verbally announce the receiver frequency of the transceiver through the push of a button.

The IC-25A, measuring 2 inches wide by 5-1/2 inches high, will continue to be available for those individuals preferring a 25-Watt two-meter mobile unit with larger operating knobs.

IC-04A and IC-04AT

Icom has announced their latest in 440-MHz hand-held transceivers: the IC-04A and IC-04AT. These multi-function, multi-feature hand-helds for 440-449.995 MHz feature frequency entry, control functions, and 32 PL tones which are controlled by the 16-button pad on the face of the radio. Also included are priority scanning (both of memories and programmable band scan) and DTMF (04AT only).

For scanning, 5-kHz increments are front-panel selectable. Ten memories with internal lithium battery backup afford flexibility for channelizing operation for easy access to most-used channels. The custom LCD readout with S-meter is unique.

The IC-04A and IC-04AT have the same styling, control features, and functions as the IC-02A(T) and utilize the existing accessory line available for the IC-2A and IC-2AT plus new accessories such as long-life and high-power battery packs.

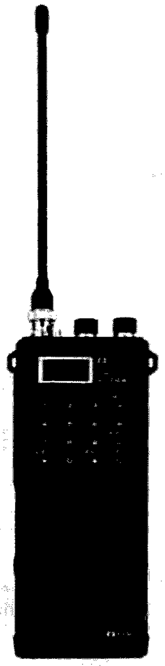
IC-271H

For two-meter communications, Icom also has developed the IC-271H, a transceiver with a high dynamic range receiver and a 100-Watt transmitter. Operating from the IC-PS30, IC-PS15, or the internal IC-PS35 (optional), the IC-271H integrates all the functions of the latest CPU-controlled radios.

Standard features include 100 Watts of power, 32 built-in subaudible tones, 32 full-function tunable memories, 10-Hz PLL locking, easy-to-read fluorescent display, scanning, and mode scan. It is 11-1/4 inches wide by 4-3/8 inches high.

To facilitate the operation of the IC-271H, Icom has incorporated a duplex touch switch, all-mode squelch, receive audio tone control, S-meter, center meter, seven-year lithium battery memory backup, 24-pin accessory connector, and microphone. Optional features include a switchable preamplifier, CTCSS encoder/decoder (encoder is standard), computer interface, and voice synthesizer.

For more information, contact *Icom America, Inc., 2112 116th Ave. N.E., Bellevue WA 98004; (206)-454-8155.*



The IC-04A 440-MHz hand-held from Icom.

LETTERS

LOG PROGRAM AVAILABLE

The response to my article "Foolproof Logging" on page 58 of the November, 1983, issue of *73* was overwhelming. I had noted in the article that if enough persons were interested, I would make the program available.

The program is now available for the TRS-80 Model III under TRSDOS 1.3 and for the IBM-PC under PC-DOS 1.1 or 2.0. The cost is $35.00 each including the diskette and user's manual. Postage is included in the cost. A version written in dBASE-II source code will be available by January 1, 1984, for several computers.

John E. Fall KL7GRF
Long Beach CA

NO SNOBS IN SANTA FE

In response to the letter from Mr. Fearon printed in the October issue, please be advised that the snobbery he felt in Albuquerque has not reached the higher elevations and arrived in Santa Fe. Being 60 miles apart, there is a world of difference in all attitudes and amateur radio especially.

The Northern New Mexico Amateur Radio Club in Sante Fe will be more than happy to assist Mr. Fearon in directing him to hams who have the time and energy to be an Elmer. When I made up my mind to go for a ticket, I started going to the Saturday morning breakfasts the club holds each week at The Pantry restaurant. There I met the most helpful and supportive crowd of guys and gals and before you knew it, I had my ticket.

The NNMARC holds regular classes both for the Novice and for upgrading to other classes. All are at no charge.

The hams who helped me on the way to a license were most eager to do so and extended every courtesy to the point of going out of their way several times, especially when it came time for the Novice exam and code test.

So, not all Southwest hams are snobs, and I hope Mr. Fearon has by now found that to be true.

Michael Langford KA5SAT
Santa Fe NM

ALBATROSS

The editorial in the October issue of *73* revealed some interesting things. I have found *73* to be a very enjoyable magazine. The editorial touched on one area I am in agreement with. *QST* and the League are getting to be a useless albatross to amateur radio. The magazine has fewer and fewer technical articles and more and more pages of contest results and pat-em-on-the-back data.

I am of the old school of home brew: If you want a transformer, wind it. I've even made my own tubes out of light bulbs. Now I run my computer on what the filament used to draw.

I am an amateur more interested in construction than in operating, so the "incentive" of the League left me cold. Similarly, there is a trend to buy everything from Japan, yet we developed the technology they copied or stole.

This country still has creative engineers, people who are amateurs. I call it poor-boy research, amateur because of low funds, not lack of skill. This country is becoming a high-technology and farm export country, though our government and corporations are too stupid to foster education or family farms.

I like *73*'s view of trying to stay ahead of the pack. The concept of developing a colledge (no, I didn't misspell college) can provide an "edge" to a student not fulfilled by some of our prestigious struc-

tured schools, provided it teaches creativity. Creativity is a rare commodity at best, yet it is the very thing that once made this country great.

Escalating the college via cable is a good limited short-term idea. But cable TV is dead, only still quivering because of greed and failure to make it duplex. The time will soon come when fiber optics will replace it, allowing duplex operation. There is your future.

In the meantime, the proliferation of satellite dishes (7-10') will fill the void of cable. Direct satellite broadcast (2' dishes) will bankrupt the cable companies.

The concept of interactive teaching is an area not touched. Suppose the main program (class) was on laser disk, supported and controlled by a magnetic diskette for your microcomputer. Q&A would be on the disk and your terminal CRT. Further support could be by packet transmitted to the satellite or local data line.

At present, I spend about $1000 (plus) four times a year to go to schools: $500 travel, $500-$800 class and lodging. Wouldn't it be more profitable if I could take an interactive class here for $750 a year total?

The University of Wisconsin at Madison and Milwaukee has superb extension programs. George Washington University, Georgia Tech, and UCLA have extension work in engineering. These people have skilled people come in from all over the country to teach a class, yet the school only organizes the class. I have made friends all over the country this way and gotten credits as a bonus.

Phil Jedlicka WD0EED
Norman OK

CALL FOR PAPERS

The American Radio Relay League will hold its Third Amateur Radio Computer Networking Conference on April 15, 1984, in Trenton, New Jersey. The conference will be in cooperation with the 9th Trenton Computer Festival (TCF84) being held April 14-15 at Trenton State College.

The deadline for camera-ready papers is March 1, 1984. All papers should be mailed to Paul L. Rinaldo W4RI, American Radio Relay League, 225 Main Street, Newington CT 06111. If you plan to present a paper, please request an author's guide and identify the title of your paper immediately. Proceedings will be sold at the conference and by mail from ARRL Headquarters.

Technical papers are invited on all aspects of amateur packet radio, AMTOR, computer-based message systems, digital speech, presentation-level graphics, and related amateur-radio digital communications via terrestrial, ionospheric, meteor-scatter, and satellite media including AMSAT-OSCAR 10 and PACSAT. Topics may include network and system architecture, proposed standards, hardware, software, protocols, modulation and encoding schemes, applications, and practical experience.

Paul Rinaldo W4RI
Newington CT

MARKETABLE EDUCATION

I enjoyed the editorial in the October issue of *73*. However, I would go a little bit further. I think that education is a big issue *now* and, if handled correctly, will bring huge profits for the first businesses to take full advantage of it. I think that the attention focused on education by the presidential commission and the media has helped to make the time ripe for business to enter. I speak with some experience, since I now teach mathematics and computer science at the college level. The emphasis placed on computers and high technology has created an anxiety among the general public to the point where those people unacquainted with computers either fear them or feel guilty about it. I have several friends who have made decent amounts of money by conducting private classes in Basic and in the operation of specific home computers.

I think that video disks—the interactive kind—would be fantastic educational media. There is now out an arcade game using interactive video disks and the kids line up ten deep waiting to use it at the arcades. Compared to standard video games, the graphics (or effective memory) of these things is really astounding.

On a slightly different subject, I think that if a simple and reliable packet node controller could be developed to the point where it was a black box whose use was transparent to the user, it would revolutionize both the ham-radio and the home-computer communities. With the popularity of computer networks such as Compuserve and The Source and with drastic rises in local telephone rates imminent, the time will very soon be ripe for both a digital (no-code) license and PACSAT-type satellites.

Warren Ziegler KI1E/2
Staten Island NY

DR. DIGITAL

Robert Swirsky AF2M
PO Box 122
Cedarhurst NY 11516

ON LANGUAGE

At a recent meeting of the WA2DCS computer club, John KI2U asked me if I was working on any interesting computer projects. John always expresses interest in my programming endeavors; perhaps it's because I tend to write unusual programs. I have been known to spend months doing some of the weirdest things ever done with a computer (at least by means of a program).

One of my favorite projects that I finished this past year was an adventure game called "Time Warp." This program needs three interconnected computers to run, not to mention a sound system. The game is based on the movie, *The Rocky Horror Picture Show*, and the objects are to save Dr. Frank N. Furter from death and to lead some other characters to safety. I'm not so sure if my results were worth the effort, but at least I gained some insight on how to interconnect computers to handle a distributed processing task.

Another of my favorite programs was an absolutely silly piece of PL/I code to play the game "dots." (I'm sure you know how to play dots—two players take turns connecting dots in a grid. The player who can make the most boxes wins.) This program was written on punch cards for an IBM 370 computer. As I had no interactive terminal at my disposal, I had to look at the output to see what move the program made and then punch my move on a card and resubmit the program deck to the computer operator. A complete game took about 4 hours to play. It played a pretty good game, and as far as I know, nobody else has ever analyzed this game before. Maybe I'll start something. (First Pacman, then Q-bert, and now, dots!)

My latest major project on a computer was an implementation of the programming language SNOBOL for microcomputers. After I informed John of this, he asked this thought-provoking question: "Why can't you develop a special ham-radio computer language?" He gave me some thoughts on what such a language might contain—Morse, Baudot, or ASCII I/O statements, as well as interrupt handling, I/O buffering, math functions for metric conversion, and "great circle" functions.

I didn't feel that ham-radio applications warranted their own language. After all, the things that John suggested could be handled with a subprogram library. Nevertheless, the suggestion started a lively discussion among our club members. So let's hear what you think about the matter. If anyone has suggestions on what a ham-radio computer language might include and what the structure might be, drop me a line. It would be interesting to see if there is a need for such a thing.

The issue of computer languages is, in itself, a hot topic. I am frequently asked what the best language is or what the easiest language is. Unfortunately, there are no answers to these questions, but because this subject generates such interest, I will devote some space to matters regarding languages and compatibility among computers.

Everything—

—you've always wanted to know about assembly language and... A number of people have written me asking about assembly language. The question I have been hearing most is how one should go about getting started with it. "It just seems so darn *complicated*" is the common cry of distress. As I tend to use many assembly-language programming examples, some people have commented that they felt lost while reading through a listing.

My reason for using assembly language is simply that there is no other way of doing certain things with a computer. When one uses a so-called "high-level" language such as Basic or FORTRAN, one finds oneself shielded from the machine. You are, so to speak, a few levels removed from the hardware of the machine. Unfortunately, this lack of intimacy between user and machine prevents the user from establishing complete control. One must be happy with how the interpreter or compiler chooses to do certain things. (Please pardon my anthropomorphism; it simply makes the sentences less cumbersome.) Like most others, I like to take the easy solution to a problem. In many instances, assembly language *is* that easy solution.

My own first experience with assembly language came from a course I took at Hofstra University: CS 110. The course assumed some prior PL/I programming knowledge and made the student realize that computers worked on a much *simpler* level than PL/I. Of course, everyone realized that the mechanism for the computer's understanding of PL/I was a program called a "compiler," but not too much thought was given to that fact. The compiler was simply regarded as a "black box." Nobody cared how it performed its black magic; the only thing people concerned themselves with was what went in and what came out.

The point of this diversion is that assembly language is *simpler* than any other programming language. That's right—simpler! The instructions are very primitive: Move a byte of data, add two binary numbers, compare a number to zero. In fact, while microcomputers usually have at least fifty different instructions, only a few are needed. The late computer scientist, Alan Turing, proved that only a few very primitive operations on binary data would suffice to compute any problem that a better equipped (i.e., a larger instruction set) machine could handle. In particular, all a computer needed were the basic logical operators and a branch statement.

With all this historical information aside, it is time for us to consider the matter of a painless approach to learning assembly language. First, get it out of your mind that this is a complicated matter. It is, in fact, a simple one—so simple that people tend to make it much more difficult. Let's start at the beginning.

In the beginning, there was machine language. Programmers would program by punching holes or flipping switches corresponding directly to memory locations in the computer. This was a tedious affair, but engineering and math types were content with this method for a number of years.

The instructions that a computer program consists of are represented as numbers in the computer's memory, and the same memory is used for both data and instructions. That means that the contents of a byte containing the binary number 10101010 could be anything from a computer instruction to a data item. One cannot tell the exact meaning of an isolated byte of memory—it must be looked at in context.

Needless to say, this business of binary numbers soon got confusing. It was extremely difficult to debug a program consisting solely of spots on a storage tube, or perhaps binary numbers represented in base 16 or base 32. Because of this, assembly language was developed.

Assembly language and machine language are very closely related. There is a one-to-one correspondence between statements written in the two languages. It is best to think of assembly language as a tool for writing machine-language programs. Much of the tedious memorizing and mathematical calculating that a programmer must take care of when programming in machine language are dutifully performed by the assembler.

The primary function of the assembler is to provide a set of mnemonic codes for the binary instructions of the computer. It is much easier to remember that BNE means "branch if not equal to zero" than that 01001100 means jump to the memory location specified by the next two bytes.

Assembly language also allows the user to work with decimal or hexadecimal numbers; conversion from one radix to another is another function handled by most assemblers. Finally, an assembler allows a person to create a program to run in various parts of memory. A machine-language program generally cannot be relocated to another portion of memory. An

assembly-language program can be placed into another portion of memory by reassembly of the program.

Each microprocessor has its own machine language and, therefore, its own assembly language. For example, the Atari computer and the Apple computer both use a microprocessor chip in the 6502 family. Because of this, they both have the capability of "understanding" the same assembly language. The obvious conclusion a person could make is that those two machines would be software compatible, at least at the machine-language level. Unfortunately, this conclusion is erroneous.

There is another factor to consider when dealing with software compatibility: differences in hardware. Let's continue with the Apple vs. Atari comparison and look at some of the hardware differences. Consider the simple matter of the clock speeds of the computers. The Atari's internal clock, which controls the speed of the microprocessor, runs at about 1.8 MHz as compared with the 1.024 of the Apple.

Does this mean that the same machine-language program will run 56% faster on an Atari? No! The Atari will be about the same speed, if not slower, because of Atari's special display processor chip. This chip takes control of the computer's bus every so often in order to fetch display data from memory. In order to do this "direct memory access" (DMA) of data, the 6502 microprocessor must be "halted" during the DMA cycle.

Another thing that slows down the computer's performance is Atari's use of interrupts. Every 60th of a second, and sometimes more often, the microprocessor is interrupted from the program that it is executing and runs a system-maintenance routine. All this interrupt and DMA business simply means that the amount of time the Atari computer takes to execute a program cannot be calculated by simply knowing the clock speed, nor can the speed of the computer be compared to another computer's just by looking at the clock frequency.

The reason that we have to consider hardware when dealing with assembly language is that one cannot separate the two. It is necessary to have some hardware knowledge in order to program effectively in assembly language. This is especially true when doing I/O-related tasks. After all, how can you get data into or out of a computer without knowing the hardware configuration?

Just keep in mind that assembly language is simpler than any other language. Think small. Each statement can do only very little. If you approach the matter with this attitude, you will find learning assembly language to be equally simple.

High-Level Languages

High-level languages remove the user from the computer's hardware. Many things that an assembly language must worry about are "shielded" by the language processor. It is this shielding that makes some things impossible to do in a high-level language; sometimes complete control is needed. However, most of the time a high-level language (such as Basic) is the better choice. The easiest solution is often the high-level language.

A wide variety of high-level languages is now available for microcomputers. In addition to Basic, implementations of C, PL/I, Algol, Pascal, FORTRAN, LISP, Ada, COBOL, PL/M, Forth, and Logo are commonly available. I will devote some time to these and comment on their suitability for amateur radio applications in future months.

Graphics

I still need more feedback on the development of a graphics standard for amateur radio. As I mentioned in past columns, I would like to establish some standards to allow users of different computers to exchange graphics data. Possible techniques could include "unit square" graphics (where coordinates are given relative to a 1 by 1 screen thereby making the center point 0.5,0.5) or standard graphics character sets. Any comments along these lines would be appreciated. Don't forget: include an SASE to ensure a reply!

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

BASIC ELECTRONICS

I've just finished looking through the FCC's new list of suggested questions for Novice-class exams. Most of the material looks pretty good. Still, it comes off looking kind of dull—row upon row of gray boilerplate. I can't help but think that the FCC could have done better by coming to me. Boy, would I have put together a test for them—you know, crossword puzzles, matching, acrostics, and so on. Don't laugh. Is it any sillier to make prospective hams memorize a binary code system? ASCII code yes, Morse code no. At least my puzzles would have a relevance to current technology, which is more than you can say for those silly dits and dahs.

Taking things a step further, imagine the new look in study guides. Page after page of puzzle solutions. Can't you just see Dick Bash at the Dayton Hamvention hawking his *Final Exam Crossword Dictionary*?

Hey, FCC! I can still help you with the General, Advance, and Extra-class tests lists. Drop me a line.

ELEMENT 1 MULTIPLE CHOICE

1) An electrical generator's magnets are:
   1) small
   2) non-polarized
   3) oppositely-polarized
   4) similarly-polarized

2) What is the current value in the circuit of an 8-Watt lamp running at 200 volts?
   1) 0.04 Amps
   2) 40 Amps
   3) 400 Amps
   4) .4 Amps

3) The henry is the unit of:
   1) work
   2) voltage
   3) capacitance
   4) inductance

4) Impedance is:
   1) the total opposition offered by a circuit to the flow of alternating current
   2) the total opposition offered by a circuit to the flow of direct current
   3) the complete resistance offered by a circuit to ac or dc
   4) determined by dividing voltage by resistance

5) The two most common semiconductor materials are:
   1) germanium and curium
   2) silicon and argon
   3) iron and lead
   4) germanium and silicon

6) Transistors can:
   1) amplify voltage
   2) amplify current and voltage
   3) amplify current
   4) none of the above

7) The banded end of a diode indicates the:
   1) anode
   2) cathode
   3) emitter
   4) filament

8) A multivibrator is a type of:
   1) Hartley oscillator
   2) Armstrong oscillator
   3) Colpitts oscillator
   4) resistance-capacitance oscillator

9) A disconnected capacitor:
   1) is harmless
   2) does not contain energy
   3) can be used as a transistor
   4) can kill you

10) D'Arsonval:
   1) was the inventor of the transistor
   2) is a type of analog meter
   3) is a type of digital meter
   4) refers to D'Arsonval's Law

ELEMENT 2 MATCHING

Match the term to its definition.

Column A	Column B
1) Acorn	A) Diode rectifier
2) Klystron	B) Unit of work
3) Nuvistor	C) Squat UHF tube
4) Dyne	D) Miniature metal/ceramic tube
5) Newton	E) Microwave tube—has a bunch cavity
6) Magnetron	F) Air-filled VLF tube
7) Phototube	G) Microwave diode
8) Mercury-vapor tube	H) Miniature tube with pins extending from its ends and sides
9) Thyratron	I) Gas triode or tetrode
10) Doorknob	J) Converts light energy to electrical energy
	K) Unit of force

ELEMENT 3 TRUE-FALSE

	True	False
1) The daraf is the unit of elastance.	_____	_____
2) Doubling a number and adding one is called "dibbling."	_____	_____
3) One handy oscilloscope use is the measurement of capacitors.	_____	_____
4) The coulomb is the unit of quality.	_____	_____
5) In magnetism, opposites repel while likes attract.	_____	_____
6) A "zig-zag" is a type of rectifier circuit.	_____	_____
7) A "zener" can be used as a voltage regulator.	_____	_____
8) There are two individual rectifiers in a bridge rectifier.	_____	_____
9) Batteries generate voltage through photosynthesis.	_____	_____
10) A logic probe is used to test 5-volt dc circuits.	_____	_____

ELEMENT 4 FILL IN THE BLANK

1) A________is a precisely dimensioned, hollow metal pipe through which microwave energy is sent.

2) The instrument that presents visual representations of an electrical quantity is an ________.

3) The soft form of carbon used in most resistors is called________.

4) The main control electrode in a vacuum tube is the________.

5) In a bipolar transistor, emitted current travels toward the________.

THE ANSWERS

Element 1:
1-3, 2-1, 3-4, 4-1, 5-4, 6-2, 7-2, 8-4, 9-4, 10-2.

Element 2:
1-H, 1-E, 2-D, 4-B, 5-K, 6-B, 7-J, 8-A, 9-I, 10-C.

Element 3:

1—True	It measures the opposition of the capacitor to be charged. Incidentally, "daraf" is farad spelled backwards.
2—True	Not to be confused with "dribbling," which is a basketball term.
3—False	By studying its waveform, I guess.
4—False	Quantity.
5—False	It's the other way around.
6—True	A variation on the three-phase, half-wave star theme.
7—True	Zener diode.
8—False	Four.
9—False	Plants use photosynthesis, batteries generate voltage with chemicals.
10—True	Computer circuits.

Element 4:
1—waveguide
2—oscilloscope
3—graphite
4—grid
5—collector

SCORING

Element 1:
Two and one-half points for each correct answer.

Element 2:
Two and one-half points for each correct match.

Element 3:
Two and one-half points for each correct answer.

Element 4:
Five points for each word correctly filled in.

Are you up on your basics?
1-20 points—Your Bash is showing.
21-40 points—Good thing the FCC doesn't re-test.
41-60 points—Qualified for your license class.
61-80 points—Time to upgrade?
81-100 points—Obviously, you hold an MSEE degree.

REVIEW

THE YAESU FT-980 TRANSCEIVER

As transceivers became completely solid state, size and weight were reduced dramatically, so I was particularly surprised at the FT-980, the latest descendant of the Yaesu FT-line. This now-famous line began with the FT-400 and became perhaps most popular with the FT-100 series. But the FT-980 HF Transceiver CAT System (for, I suppose, computer-aided transceiver) is no lightweight and it's packed full of features aimed at providing the serious radio amateur with the best communications tool available. For this review, along with the FT-980 I had the optional SP-980 speaker system and the MD-981 stand microphone. More about these accessories later. General specifications for the transceiver are shown in Table 1.

Packed in with the set was a pretty good installation and operation manual that explains the rig's capabilities. The manual included a couple of loose sheets that detail connections for an alternate means of keying a linear amp if it requires more than 200 mA of switching and updated filter installation instructions. Because this FT-980 had all the optional AM and CW filters already installed and I was trying to key a linear with current requirements less than 200 mA, these provided no extra trouble—and I doubt they would anyway.

The manual is reasonably well written and doesn't contain many misspellings and odd sentence structures typical with some imported equipment. Separate from the manual are 22 pages of schematics and 7 pages of block diagrams! If you have the "right stuff" to tear into the FT-980, at least you'll have a fighting chance with this documentation. Also in the manual is a thorough description of accessory interconnection along with pinouts for each plug and connector. An added bonus in the package is a nice four-color map of Japan for award use; it's in Japanese, though.

So much for the documentation—let's get this unit on the bench and start operating. "Oof," says I. "This thing weighs a ton." Actually, it weighs close to 40 pounds with all the options installed. In the shipping box I found a bag of all kinds of plugs and connectors, tilt feet, fuses, three-wire line cord, and two AA-cells for the power-off memory retention. The AA-cells were the first of several oddities. Memory backup is provided solely through these cells—no nicads, lithium cell, or anything else. Yaesu says to replace them every six months or "adios" to the FT-980's memory.

As with several other available "competition-grade" transceivers, the FT-980 covers all the amateur bands, including WARC, and acts as a separate 150-kHz-to-29.9999-MHz general-coverage receiver. With the memory backup energized, upon power-up the FT-980 greets you exactly as you last left it. Should you elect not to use the memory back-up or should the AA-cells fail, the 980 defaults to 7.000 MHz, general coverage.

Rocking the power switch on illuminates the two large analog meters and the blue digital frequency/mode displays. The meters provide quite a monitoring capability as shown in Fig. 1. The upper digital display includes frequency readout to 10 Hz as well as USB, LSB, CWN (narrow), CWW (wide), AMN, AMW, FSW, and FM, to match the position of the Mode switch.

Receive Features

To operate, first select Ham or Gen (eral) coverage by depressing the appropriate push-button. Band selection is made through three momentary-contact push-buttons: Up, Down, and Repeat. These as well as most other functions are selected via momentary-contact push-buttons that function either as toggles (push-on/push-off) or as simple entry switches. A soft beep verifies that switch contact has been made and the beep can be turned off.

Operating frequency can be selected five ways: 1) main tuning knob, 2) 10-kHz/step push-button, 3) Up/Down 5-kHz push-buttons, 4) a keypad, and 5) up to 12 memory frequencies selected by a rotary switch. Yaesu's optional stand and hand-held microphones afford frequency selection via push-buttons, although without as many options.

Upon power-up, I was impressed with

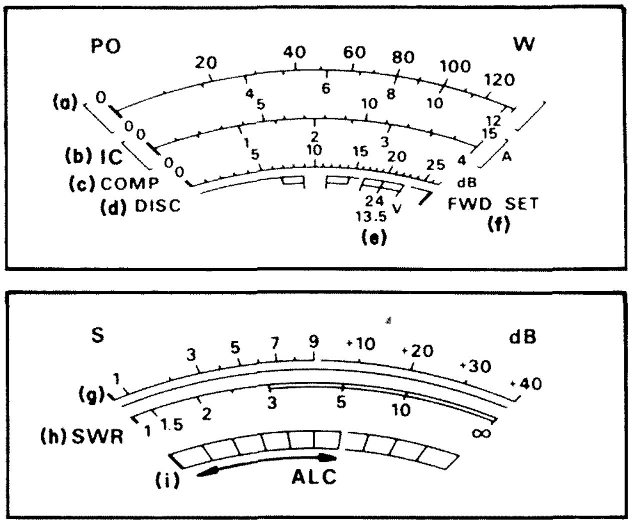


Fig. 1. Details of the FT-980's two multifunction meters: a) power output in Watts (output of 10-Watt low-power version of FT-980 is read on bottom of this scale); b) output-transistor transmit current (all modes); c) SSB speech processor compression; d) center-scale tuning for FM reception; e) Vcc safe zone; f) swr forward set mark; g) S-meter; h) swr scale; i) safe alc zone for SSB.

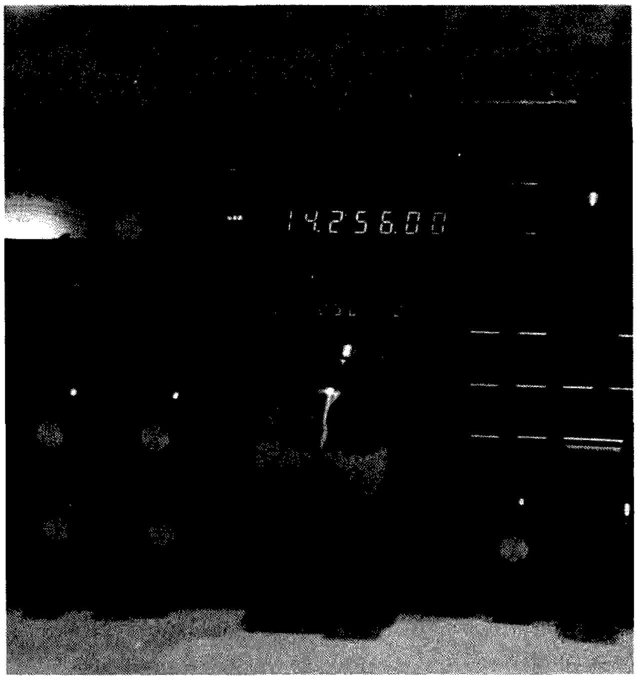


Fig. 2. Comparison of the digital (top) and analog (bottom) "sub-display" arrangements. The digital display is straightforward; the analog one is inscrutable.

TRANSMITTER

Frequency Range

Band	Frequency (MHz)
160	1.5–1.99999
80	3.5–3.99999
40	7.0–1.49999
30	10.0–10.49999
20	14.0–14.49999
17	18.0–18.49999
15	21.0–21.49999
12	24.5–24.99999
10	28.0–29.99999

Emission Types
LSB,USB (A3J/J3E)
CW (A1/A1A)
AM (A3/A3E)
AFSK (F1/J1B)
FM (F3/F3E)

Power Output
(Watts, all bands)

SSB, CW	100 (PEP)
AM	25
FM, FSK	50

Maximum FM Deviation
+5 kHz

AFSK Shift
170, 425, 850 Hz

Output Impedance
50 Ohms, unbalanced

Frequency Accuracy
Better than +3 ppm

RECEIVER

Frequency Range
150 kHz to 29.99999 MHz, continuous

Circuit Type
Triple-conversion superheterodyne

Image and I-f Rejection
Better than 70 dB

Dynamic Range
Better than 95 dB with 300-Hz CW filter

Audio Peak Filter Range
350-1400 Hz

I-f Notch Filter Range
(demodulated)
500–2700 Hz

Selectivity
(Adjusted for maximum i-f width)

Mode	−6 dB (width in kHz)	−60 dB
SSB,CW (W/N), FSK	2.5	4.2
CW (narrow)	0.3	0.6
CW (wide)	0.6	1.2
AM (no filters)	6.0	17.0
AM (wide)	5.0	12.0
AM (narrow)	3.0	9.0
FM	12.0	24.0

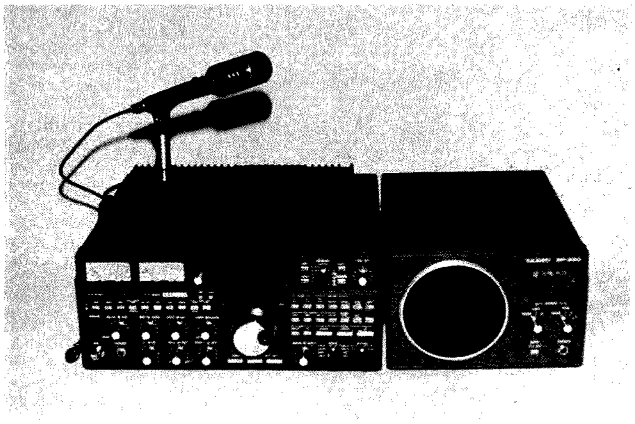
POWER REQUIREMENTS

Voltage
Ac: 100 to 120 volts or
200 to 234 volts
50–60 Hz

Power Consumption
Receive: 72 VA
Transmit: (100 Watts out): 530 VA

Physical Characteristics
Overall Dimensions:
15 inches wide
6-1/2 inches high
18-1/2 inches deep
Weight:
Approximately 38 pounds

Table 1. General specifications for the Yaesu HF Transceiver FT-980 CAT System.



The Yaesu FT-980 with companion mike and speaker.

Operating side of the FT-980. The curious pseudo-analog display is right above the main tuning control (more on this in the text and Fig. 2).

the audio quality of the receiver. It has an excellent built-in speaker. When the accessory speaker or headphones are plugged in, the internal speaker is disconnected.

On receive, you have AF gain, RF gain, Noise Blanker, Tone, Squelch (FM only), i-f Width and Shift, wide and narrow filters (if installed), a calibrated 0-30-dB rf attenuator (in 10-dB steps), a Mode switch, and Notch and APF (audio peak filter—CW only) controls to play with. You can do some pretty fine knob-twiddling and slice away at the pileups and heterodynes. The narrow filters are very sharp and a dial-lock push-button holds the frequency in case you accidentally bump the main tuning knob while tweaking all the other controls.

The frequency displays require some special mention. Beneath the upper digital frequency and mode display is another window, a sub-display that Yaesu calls a "...synthesized analog display [that] provides a relative frequency indication which scrolls when the frequency of the selected vfo is changed." What it amounts to is a digital simulation of an analog dial display of frequency. See Fig. 2. It's confusing; I couldn't find a single reason for its being there. Because a digital frequency display accurate to 10 Hz is right above it and this pseudo-analog display is accurate only to 1 kHz, I'm curious as to Yaesu's intentions. And while speaking of displays, a Dim push-button reduces meter and display brightness by about half for low-light or nighttime operating.

Other controls include push-buttons for transmit and receive clarifiers that actually use the main tuning control. This is a little strange if you are used to a separate clarifier knob. Also included are push-buttons for selecting which vfo (ham or general coverage) will be used for transmit (ham only) or receive (either) or which memory channels will do the frequency controlling. Split-frequency operation is possible, along with push-buttons to give you the difference between vfo and memory channel frequencies. It's relatively easy to store and retrieve a memory frequency, but it's too complex to describe here all the possible interactions, shifting, and operating options available. This transceiver does *not* have a built-in scan capability, but you can store, retrieve, and exchange memory and vfo frequencies handily. In place of a bfo control, there's a rear-panel CW pitch slide switch that selects 500, 600, or 700 Hz as the CW receive tone.

One thing that I really did miss was a WWV calibration control. Yaesu must figure that the synthesizer is right on because there is no way that I could find to adjust zero-beat with WWV. The specs say frequency accuracy is better than 3 ppm for 0-40 degrees C (32-104 degrees F). That means WWV should only be about 30 Hz off at 10 MHz!

Transmit Features

Satisfied that I wouldn't do any damage, I next tried loading the FT-980—no problem. Power output is adjustable with a Drive control. I was, however, a little suspicious of the built-in swr metering circuitry when it indicated an absolutely flat 1-MHz bandwidth on the 10-meter elements of my triband quad. The swr monitoring circuitry will protect the finals, though, reducing power out to about 75 percent of available output power at ideal (1:1) conditions when a 3:1 swr is encountered. An on-demand fan cooling system is employed to control output transistor temperature.

This rig also had the Curtis 8044-chip-based keyer option installed and the whole system is set up for full break-in operation. I was a little disappointed at the speed control of the keyer, though. It seemed to have a very narrow realistic speed range but would go phenomenally high.

The FT-980 has a nice control and metering setup for speech compression. You can read dB of compression and use the Monitor control and a pair of headphones to adjust the processor for maximum punch and minimum distortion while listening to yourself. And an Automatic Mike Gain control enables you to set a modulation threshold to help eliminate background noise. Although a little tricky to adjust, these controls can give you tremendous audio capabilities.

Recalling memory frequencies and returning to your original frequency, using the transmit and receive clarifiers, and figuring out just what split frequencies you are on is a little confusing at first. The yellow LEDs next to some of the switches help, but because the radio can do so much, it's a little overwhelming. You eventually feel comfortable after getting to experiment for a while. Three Tab push-buttons can be employed on transmit and receive to limit the frequency excursion between a high and low limit you select. As the manual states, possible uses for this feature include limiting operation to legal bands or subbands of an operator's license class.

An FSK Shift slide switch on the rear panel selects shifts of 170, 425, or 850 Hz while the mark tone stays at 2125 Hz. Power output is limited to 50 Watts for FSK as well as FM, 25 Watts on AM.

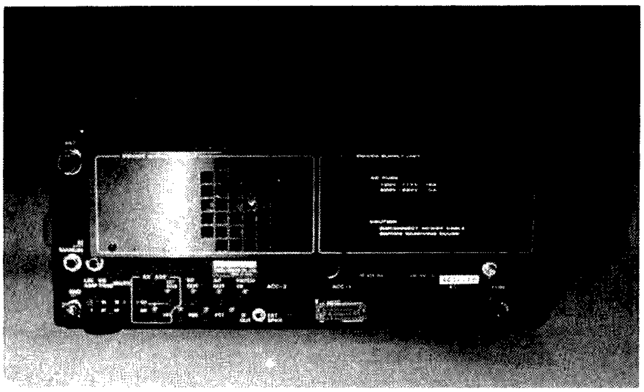
SP-980 Remote Speaker

This outboard speaker not only complements the FT-980, it also adds some more knobs to twiddle during receive.

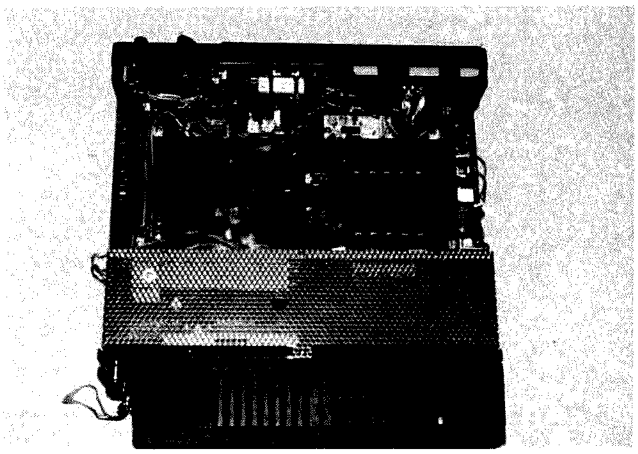
Built-in passive L-C circuits are switched in and out of the circuit via front-panel selector switches. Response curves on the front panel show the bandpasses produced as the Low and High filter switches are clicked through their ranges. An Input switch enables you to select from two separate audio inputs, and there's also a Phones jack. Combined with the Tone switch on the transceiver, the filters provide an extra dimension in receive capability. All in all, a nice addition to the station.

MD-1 Microphone

Yaesu's penchant for buttons and switches carries over into their "stand" microphone. In addition to a standby/transmit switch located on the mike itself, the rig's Up/Down/Fast frequency-select



Rear panel of the FT-980 has almost as many switches as the front panel. The projecting module holds the power amplifier (left) and the power supply (right).



Top view of the FT-980. The optional keyer module is the small rectangular PC board located at about the one-o'clock position. The vco, PLL, and vfo subassemblies are under the metal covers. Power supply and control circuitry are under the screened-in section at the rear.

buttons are duplicated on the mike stand, just in case you're comfortably settled into your easy chair and can't quite reach the tuning buttons on the rig. There's also push-to-talk and lock switches, a high (50k-Ohm)/low (600-Ohm) mike impedance switch, and a three-position tone switch. The mike can be easily removed from its cradle stand but the short cord limits your mobility. An optional MH-1 hand-held mike also is available that includes Up/Down/Fast push-buttons and a two-position tone switch.

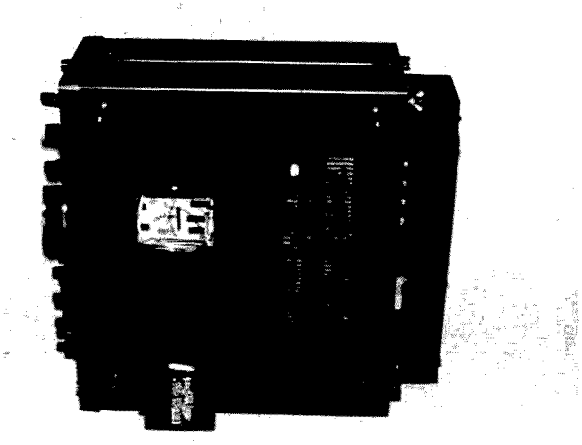
Conclusion

I really liked the FT-980. While it's designed with the serious amateur in mind, it also can help simplify the operating position because it can include a keyer, swr monitor, FM circuitry for transverter drive, full break-in QSK switching circuitry, a separate receive-only antenna switch, and a full array of interface connectors. It also has rear-panel jacks that access its internal microprocessor and a serial interface that allows external control via an outboard microcomputer. Unfortunately, details other than plug pinouts and some cryptic signal names are not provided. So you'll just have to experiment (carefully).

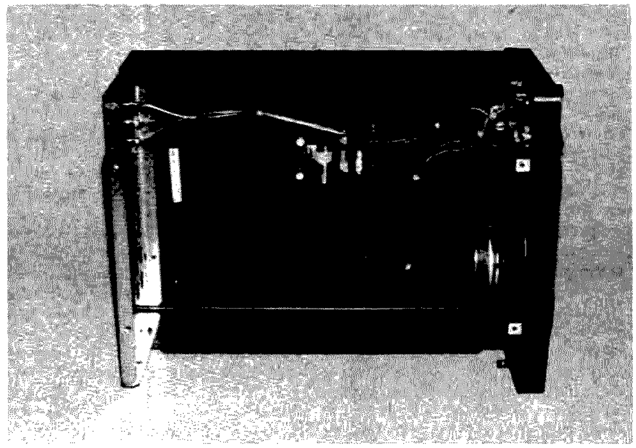
The current crop of amateur transceivers offers tremendous flexibility, along with capabilities unheard of a few years ago. The penalty for this is increasing cost and initial bewilderment when confronted with the maze of controls and switches. But get your hands on an FT-980 and spend some time getting used to it. I think you'll find this is one nice piece of equipment.

For more information, contact *Yaesu Electronics Corp., 6851 Walthall Way, Paramount CA 90723, (213)-633-4007.* Reader Service number 476.

Gene Smarte WB6TOV
Hancock NH



Bottom view. The small door to which the memory backup-supply AA-cells mount dangles free. The circuitry on this side is the i-f (left) and the rf (right). Most of the rig is fairly accessible.



Inside the SP-980 speaker. If you've ideas for station accessories, you have plenty of room here.

DX HIDDEN ASSET LOOP ANTENNA

H. Stewart Designs has just introduced a new antenna design called the DX Hidden Asset Loop Antenna. What you get for $12.50 are the *plans* to build the antenna and a *complete description* of the antenna itself, including history, performance, configuration, construction, and installation. It is called the DX Hidden Asset Loop because it is capable of working DX, it can be installed indoors and is thus "hidden," it is undeniably a loop, and it is an asset to your station. Read on and find out how we proved to our satisfaction that this antenna is well-named.

73 received a prototype antenna that had been made up by H. Stewart Designs to illustrate the construction materials and method of assembly. They even included a wooden mounting support!

Jim Gray W1XU asked me if I would be interested in reviewing the DX Hidden Asset Loop Antenna for *73*. I readily agreed. Not knowing what to expect, I went to work.

After opening the package, I discovered that I had a support board with vertical antenna sections already attached, two antenna loops, each consisting of three pieces of small-diameter aluminum tubing, connectors, clamps, four corner pieces with clamps, and one set of plans and instructions.

With the vertical elements already attached to the support board (which had all the necessary holes pre-drilled), it was easy to insert the four corner pieces (tubing elbows) through the holes provided and slide them over the ends of the vertical elements. The required distance between the two loops (39.5") was already pre-marked on the support board, so the next step was to clamp these pieces in place with the hose clamps.

Next, I assembled the loops themselves by butting the three pieces of tubing in the connectors and clamping them with the hose clamps. Then, I inserted the ends of each loop into the four elbow pieces to a depth indicated by black tape wrapped about 9" from each end and clamped them in place for a first trial. This resulted in an assembly that looked like two large basketball hoops, one above the other, attached to the board and connected to each other by a pair of vertical elements spaced a few inches apart, forming a loop at each end of the board. The instructions said that the antenna should resonate at 28.5 MHz if the dimensions were followed exactly during assembly. However, depending upon the environment in which the antenna is erected, it is possible that the resonant frequency will be slightly different due to house wiring, plumbing, proximity to power lines, etc. (In my case, with the antenna in the attic, no changes had to be made.)

I attached the vertical support board to a horizontal two-by-four that I nailed to the attic rafters. Now it was time to connect the coax to the parallel vertical elements. One of these is separated by about an inch in the middle, forming a gap across which the coax is fastened. The shield braid of the coax goes to one side (lower) of the element, and the center conductor goes to the other (upper) side. Soldering is easily and quickly accomplished. The coax was then led away from the antenna at right angles for about ten feet (instructions say for at least a half-wave—16 feet—for best results) and then downward through a plastic conduit to my shack in the basement.

After that, I was ready to get on the air, but I felt that a test of swr should be made first, so W1XU brought over his bridge. Applying power at 28.1 MHz (the lower end of the 10-meter Novice band), the swr came out at less than 1.5:1, so I decided not to change anything. Now for the on-the-air test!

Within an hour's time, I worked two Texas stations on 10 meters. The band had just opened, yet one station gave me a 579, and the other (a few minutes later) gave me a 599! This was with about 70 Watts output from my FT-707.

Just for fun, we switched to 40 meters to see if we could receive anything there. Signals were jumping! So, what the heck, it couldn't hurt to see if the antenna loaded on 40, could it? Believe it or not, it did, even though the swr was high. The FT-707 has a shut-down circuit in the final to protect it from overload, but I found that the output was still about 50 Watts . . . so I went ahead and called CQ. I worked one ham in Maine and another in New York, with a 559 and a 589, respectively! I was hooked on the DX Hidden Asset Loop Antenna. Even on 80 meters, the reception I get is remarkable, but I haven't had the nerve to try transmitting on 80.

I feel that the antenna is highly suited for emergency and Field Day communications and is ideal for the ham who lives in an apartment or condominium or otherwise must put up with limited space. The DX Hidden Asset Loop Antenna occupies a space only about six feet square and four feet high, so I can highly recommend it for any ham who has a space problem. Not only that, it works out like gangbusters on ten, so you will really have a DX antenna—I'm sure.

General Description

In essence, the DX Hidden Asset Loop Antenna is a single quad loop turned in upon itself. It retains the quad's characteristics of quiet reception, low cost, and ease of assembly. However, its configuration is such that it can be installed in a roughly cubical space that is approximately equal to one-sixth wavelength on a side at the operating frequency. The only other requirement is that the selected installation site permit the coax to be brought away from the antenna at right angles for at least one-half of an electrical wavelength.

One of the features of the DX Hidden Asset Loop Antenna is direct feed with 50-Ohm coaxial cable without an antenna coupler or matcher required. (We think that its performance would certainly not be hurt in the least by the unbalanced feed recommended, but, if desired, a balun could be installed at the feedpoint to ensure balanced feed of this balanced antenna.) The antenna is very broad-banded; you can expect a useful bandwidth of about 3 to 5 percent of the resonant frequency, meaning that on ten meters, it will cover between 500 kHz and 1 MHz from the resonant frequency. By sliding the adjustable-length pieces in and out, you can set the resonant frequency anywhere you want it in the band. Typically, the swr at resonance will be 1.5:1 or less, and it is probable that you will be able to get it below 1.2:1 with careful tuning. However, if the antenna is mounted close to conductors like house wiring or copper plumbing, you may have trouble getting the swr as low as otherwise possible. One good feature is that H. Stewart Designs covers these contingencies in the plans and instructions and tells you how to make the necessary adjustments to compensate.

The only comment that might be considered a negative aspect is that the DX Hidden Asset Loop Antenna is not yet available in kit form! You will have to make up your own kit from the instructions and plans . . . which won't be at all difficult to do. We hope that H. Stewart Designs will consider offering this unique and practical antenna in kit form later on, because we think they have a winner. I'm sure you will think so, too, after you build yours. Plans and instructions are $12.50 from *H. Stewart Designs, PO Box 643, Oregon City OR 97045.* Reader Service number 478.

Ross Kenyon KA1GAV
73 Staff

BENCHER KEYER PADDLE

One of the great delights of CW is the beautiful "music" that can be generated by a good operator using good equipment. Today's CW operator has the advantage of a variety of keys and keyers to choose from, most of which have full iambic capability. As you know, iambic-mode keying allows certain characters to be formed more easily and quickly. For example, letters like F, L, Q, Y, and so forth require

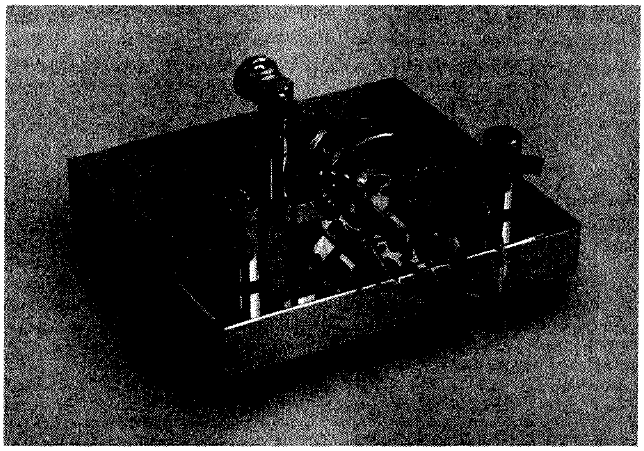
fewer paddle movements when keyed in the iambic mode.

Many operators have discovered the Bencher full-iambic keyer paddle, suitable for use with all of the electronic keyers and well known for its functional beauty. In fact, I have been using a Bencher paddle since 1979 and find that I like it better and better each year. It seems to be settling in. . . or perhaps I am the one that's settling in! Unfortunately, I never learned iambic keying, and I use the key in the ordinary bug fashion. Just the other day I was talking with Bob Locher W9KNI, who —with Jerry Benedict— is a partner in Bencher, Inc. (Benedict plus *Locher* = *Bencher.*) I lamented the fact that I had never learned iambic keying and therefore wasn't making full use of my paddle. Bob laughed and said, "You're not alone, but we have just developed something for hams like you and for hams who are used to a bug—a non-iambic paddle for use with either full-iambic or non-iambic keyers."

We chatted a while longer about keys, keyers, and paddles, and, after a bit of adroit arm-twisting on my part, Bob finally knuckled under and promised to send me one of the new paddles, realizing perhaps that I was one of the last old-fashioned holdouts who could never learn iambic CW. Maybe he just took pity on me.

Whatever the reason, I soon received a large box full of plastic worms. Buried within the plastic protection was a smaller box enclosing the key. Inside that box I found a cardboard partition or separator that holds the very heavy paddle base in place and prevents the relatively delicate paddle mechanism from being dislodged and damaged during shipment. The entire package is neat, strong, and extremely well designed. . . a hint about the contents, too!

The key itself looked much like the original—only better, if that is possible. It has



Model ST-2 Bencher paddle.

a heavy chrome-plated base with rubber feet that keep the key solidly in place on your bench or desk and inhibit its walking around when energetically operated. The paddles and their unique gimballed actuating mechanism are supported on sturdy pillars screwed into the base. The finger pads are clear plastic ovals (as opposed to triangles on the original Bencher paddles) with chamfered, or bevelled, edges that invite your fingers to slip over them while keying. . . providing a very nice feel.

The tension spring is very easy to adjust on this model because the spring loop is captured by an adjustable screw with a knurled knob at the center post. The contact space adjustment between paddles and slide posts is made as before, with Allen screws and lock screws set into the posts. Bencher has thoughtfully supplied the Allen wrench for you, attached to the underneath side of the base, where it can't get lost. Perfect spacing adjustment and tension, suited to your own specifications, can be obtained quickly and easily the first time you try.

The two sides of the key, that is, the paddle electrical contacts, are brought through the base by insulated bushings to solder lugs attached by 10-32 Phillips-head screws. The ground side of the key is a solder lug firmly screwed to the base itself. There is also a plastic retainer that firmly holds the lead wire from your paddle to your electronic keyer. The wire is not provided, of course, but the one you use now will be satisfactory. I use a vinyl-covered, double conductor, shielded cable. . . similar in size and appearance to a microphone cable, or a piece of coax. After the electrical attachments are made to the solder lugs, the cable is clamped down so that the connections can't pull loose.

You'll find the Bencher paddle easy and pleasant to use. . . it seems to invite your fingers to use it easily and correctly. In my own case, I was extremely pleased to find that I stopped making keying errors through misuse of the iambic feature. My CW improved perceptibly, if not dramatically. I think you'll like your new Bencher paddle, especially if (like me) you don't know iambic keying, yet you want a key that will enable you to get the most out of your electronic keyer and make beautiful "music."

The Bencher paddle, Model ST-1 (black-finished base), is available at $46.95 amateur net. Model ST-2 (chrome-finished base) is priced at $59.95, and Model ST-3 (gold-plated base, available on special order) costs $150.00. Write to *Bencher, Inc., 333 West Lake Street, Chicago IL 60606*. Reader Service number 477.

Jim Gray W1XU
73 Staff

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

It's February, and, not to offend the followers of your friendly neighborhood groundhog, I'd like to celebrate Valentine's Day this year. A Valentine to all of you readers, who send me the most interesting mail.

I would like to lead off with a note from Peter Martinez G3PLX of AMTOR fame. In part, Peter writes, "I am glad to see that interest is picking up over there after such a long time. It seemed for many years that AMTOR was strictly a European system.

"It is true that in the early days of AMTOR, I was offering a program that would run AMTOR on a 6800-based computer, but this was written in source code only and was incomplete in that it required all the interfacing to the computer hardware to be written. There were very few people able enough to use the program in this form.

"So this program is no longer available, and I turned my attention at that time to designing a small PCB, with on-board CPU, ROM, etc., which would enable people to get on the air much easier than tackling the difficult software task. The Mk2 version of this kit is still available from ICS Electronics Ltd, PO Box 2, Arundel, West Sussex, England, either in kit form or as a ready-made board. It requires a single 5-volt supply, and will interface at TTL serial Baudot code to any existing RTTY system.

"I think you will see that the initial approach to AMTOR in its early days 5 years or so ago has fallen by the wayside and given way to others. There are not, as then, very many experienced machine-code programmers amongst the amateur-radio fraternity, and most users now and in the future will prefer to buy ready-made hardware or software. There will be no shortage of either before very long."

I do appreciate these comments, excerpted from a much longer letter written by this pioneer of AMTOR.

Bill Emerson WA1EVD, D.M.D., passes along his comments that he would like to see a compilation of RTTY Loop columns and also that, "I hear more AMTOR now, but 60-wpm Baudot is still the common mode. Lingua Franca?" I suspect that Murray, or Baudot, will remain such for quite a while, Bill. With the number of machines out there, I doubt if the "sixty standard" will soon roll over and die.

Nonetheless, several of you are expressing various forms of interest in computerized RTTY. Lester L. Johnson AH6AA of Sandpoint, Idaho, relates having built a demodulator from an article in an old issue of *73*. He couples that with a commercial AFSK oscillator and a TRS-80(R) computer, model unspecified. Lester would like a way to interface his computer to the terminal unit and such. He notes that the I/O structure of the Model I TRS-80 is different than the Model III; but does not say which he has. I do not have any ready information to accomplish this, Lester, but I am sure that a number of our readers have. Let me hear from you out there, and I will publish the best schemes for all to benefit.

Lester also notes that he would like to run his rig, a Kenwood TS-120, on RTTY, with the power cut back to about ten Watts. I would say, off the top of my head, that this should be okay. Normally, cutting the power back to that extent should be sufficient to protect the finals from overheating. I have run my 100-Watt transmitter at about 50 or 60 Watts for prolonged periods without damage, but I like to take chances!

Another computer user is Anson R. Hyde K4EK, M.D. Dr. Anson, who lives in Alexandria, Virginia, just over the river from Washington DC, has used his IBM-PC on two-meter ASCII RTTY using a telephone modem to output tones. He would like to know if there are any programs around to run Murray on this machine. Well, that is one machine that I have seen *nothing* for RTTY printed on. I don't know if IBM-PC users are not the "hamming" type (I suspect that they are not) or if the average ham is looking for a more modestly priced machine (so that that is where the manufacturers concentrate their marketing), but RTTY for the IBM-PC? Zip! I would encourage anyone who has put together such a program to write it up and send it to me here for inclusion in a future column, or make it a full-scale article and send it to our fair editor. We're waiting, we're waiting!

Greetings to Dean E. Strand KA0KKZ of Davenport, Iowa. Dean passes along a string of thoughts, a few of which I shall share with you all. Dean notes that he is using a Robot 800 keyboard, and when using it on CW in the Novice bands, he likes to set it to send characters at ten words per minute, with five-word-per-minute spacing. He feels that this makes the code more copyable and helps the newcomer improve his code speed. I agree, Dean, and this has even been the way the best code tapes are made.

Dean writes he has difficulty tuning in stations using a dedicated scope display on his terminal unit. Well, in an edition of this column several years ago, I covered how to hook up a general-purpose oscilloscope to act as a tuning device for RTTY. All you need are mark and space signals out of your demodulator. Feed them to the vertical and horizontal input of any old scope and tune the "+" pattern to maximum. Cheap scopes can be picked up at most hamfests and can be used for other things when not tuning in a RTTY signal.

Like all of us, Dean is looking to computerize his station. He notes that "there are at least two ways to go, one to get a good general-purpose computer (when I say good, I mean DEC Rainbow, IBM-PC, or HP Professional class, not VIC or Atari

stuff) and use and interface...that includes AMTOR. The other way would be to get a...top-of-the-line unit...with all the whistles and bells." Now hold on, Dean. I think you might find that the top-of-the-line computers you mentioned might just be overkill for a ham shack. Don't knock the cheap stuff. I just got another small computer in here, a TRS-80C (also known as the CoCo), and am amazed at what can be done. The 6809 is a fantastic chip that can run rings around many other systems. If you want a big computer for business use or such, fine, but don't sell the little stuff short. It ain't so little anymore.

Leonard Laurel WA6FBL of Fort Bragg, California, is one of those with what might be considered a small system. He is looking to hook up his TI-99/4A on RTTY. Well, Len, as I write this column, the newspaper is filled with the news of Texas Instruments' decision to stop production of the 99/4A, so I don't know what the future holds. As with the IBM-PC, I have seen next to nothing in print about using the 99/4A on RTTY. I only hope that someone out there is doing it and sending the information in to be passed along. Good luck.

From the "left hand don't know what the right hand is doing" department comes a note from Karl Thurber W8FX from Millbrook, Alabama. Karl asks, "Have you run into anyone who has successfully interfaced a Commodore VIC-1525 printer to a Hal CT-2100 Communications Terminal? The Commodore printer (which is the standard one used commonly with the VIC-20 and C-64 computers) has a so-called 'Commodore serial ASCII' bus, while the CT-2100 has provisions for an 'ASCII printer' and 'RS-232C' output, neither of which appears to be suitable for connection to the 1525 printer without some sort of interface. A letter to Hal brought a 'we know nothing about that printer' response, so I'm stymied at this point."

The first thing which occurs to me is to check that both devices are operating at the same baud rate. It is possible that one may be set at, say, 110 baud—like for a Teletype KSR-33—where the other may be at 300 or1200 baud, such as most serial printers are. Also, check to see if the Ready To Send (RTS) and Clear To Send (CTS) lines are used to inhibit and enable print, and, if so, that they are hooked up correctly. Without some sort of documentation, those are my first suggestions. Perhaps others have done this hookup and will let us know. I have confidence in you all out there!

Several of you in your letters suggested, that a book compilation of the first several years of this column would be helpful. I agree with you, but it will take more than your notes to me and my intentions to make such a book a reality. Drop a line to the editor of *73*, and to me as well, and let us know that there are enough of you out there interested to make a go of it. In the meantime, keep up with all the new developments yet to come. With the arrival of the CoCo here in the shack, I hope to be able to take a look at some of the 6809 software that has been floating around beyond my reach for a while. As soon as I see it, I'll tell you about it—right here, in RTTY Loop.

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

ARIZONA QSO PARTY
Starts: 1800 GMT February 4
Ends: 0600 GMT February 5

Sponsored by the Southern Arizona DX Association. Single-operator and club entries; all bands and modes but no repeater contacts allowed. Each station may be worked only once per band per mode.

EXCHANGE:

RS(T) and state, province, DXCC country, or Arizona county. Novices and Technicians also sign /N or /T respectively.

FREQUENCIES:

Phone—3895, 7230, 14280, 21365, 28560.
CW—60 kHz up from lower band edge.
Novice—25 kHz up from lower band edge.

SCORING:

Count 1 point per phone QSO, 2 points for each CW or other mode QSO, and 4 points per QSO with Novice or Technician in the Novice bands. Arizona stations multiply QSO points by number of states, provinces, and DXCC countries. Others multiply QSO points by number of Arizona counties (15 max.). The club station W7NQ also counts as 1 multiplier for non-Arizona stations. Non-Arizona stations working all Arizona counties and W7NQ may double the multiplier.

AWARDS

Certificates for the highest-scoring station in each category: Arizona, non-Arizona, and Novice/Technician. In addition, certificates for highest score in any Arizona county, state, province, or DXCC country in which there are entries.

Other certificates for Arizona and non-Arizona clubs whose members' scores combine for the highest score. Club entries must consist of at least 5 individual entries to be eligible. Club residency is determined by mailing address.

ENTRIES:

Individual entries should show each station worked, exchange plus time, frequency, and mode of each QSO. Include a summary sheet of your scoring and dupe sheets for bands with more than 50 QSOs. Entries may designate one club with which they are participating. Deadline for individual entries to be received is March 4.

Club entries should be submitted by a club officer with a summary of callsigns and claimed scores. To be counted toward the club total, the individual entries must also designate the club. Deadline for club summaries is April 4.

Include a large SASE for results. Entries should be addressed to: Southern Arizona DX Association, c/o Philip M. Stickney N7BUP, 1890 West Paseo Cuenca, Tucson AZ 85704.

ZERO DISTRICT QSO PARTY
1900 GMT February 4 to 0100 GMT February 5 and 1500 GMT February 5 to 2400 GMT February 5

Sponsored by the Davenport Radio Amateur Club. Stations outside of Zero district will work Zero stations only, Zeros may work any station. The same station may be worked once on each band (80, 40, 20, 15, and 10 meters only) and each mode (CW and phone). However, mobile stations may be worked each time they change counties.

EXCHANGE:

RS(T) and ARRL section. Zero-District stations also must send county.

FREQUENCIES:

3560, 7060, 14060, 21060, 28060, 3900, 7270, 14300, 21370, 28570, 3725, 7125, 21125, and 28125.

SCORING:

Each phone QSO is worth one point; CW QSOs are worth two points. Non-Zero-District stations multiply by the number of Zero-District counties. Zeros multiply QSO points by the total ARRL sections, Zero-District counties, and DXCC countries worked.

ENTRIES & AWARDS:

A plaque will be awarded to the high scorer in the Zero District and high scorer from outside Zero Land. Certificates will be awarded for high scores in each ARRL section, DXCC country, Novice/Technician class, and mobile categories. Results and a participation certificate will be issued to all entrants who include an SASE. Mail logs by March 10 to WØBXR, 2131 Myrtle, Davenport IA 52804.

SOUTH CAROLINA QSO PARTY
Starts: 1800 GMT February 4
Ends: 2359 GMT February 5

The QSO party is again sponsored by the Colleton County Contestors. The same station may be worked on each band and mode, simplex only. South Carolina mobile stations that change counties are considered new stations. Novice and Technician stations please sign /N or /T.

EXCHANGE:

RS(T) and state, province, country, or South Carolina county.

SCORING:

Phone contacts are worth 2 QSO points; CW contacts are worth 3 points. The multiplier for South Carolina stations is the number of states, provinces, and DX countries worked. Others multiply QSO points by the number of South Carolina counties worked (46 max.).

FREQUENCIES:

Phone—3895, 7230, 14280, 21365, 28560.
CW—3560, 7060, 14060, 21060, 28060.
Novice—3725, 7125, 21125, 28125.

AWARDS:

Certificates to top-scoring station in each South Carolina county, state, province, and DX country. Novices and Technicians compete only with other Novices and Technicians.

ENTRIES:

Include a summary sheet with your entry showing scoring and other information. Indicate each new multiplier in your log as it is worked. Novices and Technicians must indicate class on entry. Include a large SASE for results. Send entry by March 5 to: Colleton County Contestors, c/o Elliott Farrell, Jr. KE4VP, Rt. 3 Box 658, Walterboro SC 29488.

VERMONT QSO PARTY
2100 GMT February 4 to 0700 GMT February 5 and 1100 to 2400 GMT February 5

Sponsored by the Central Vermont Amateur Radio Club (W1BD). Each station may be contacted once on each band and mode (CW, phone, RTTY). CW and RTTY contacts must be in the CW and RTTY subbands.

CALENDAR

Feb 4-5	**South Carolina QSO Party**
Feb 4-5	**Arizona QSO Party**
Feb 4-5	**Vermont QSO Party**
Feb 4-5	**Zero District QSO Party**
Feb 4-6	**New Hampshire QSO Party**
Feb 11-12	**Dutch PACC Contest**
Feb 18-19	**YL-ISSB Commo System QSO Party—Phone**
Feb 18-19	**ARRL DX Contest—CW**
Feb 18-20	**America Radio Club International DX Contest**
Feb 24-26	**CQ Worldwide 160-Meter DX Contest—SSB**
Feb 25	**RTTY World Championship Contest**
Mar 3-4	**ARRL DX Contest—Phone**
Mar 17-18	**YL-ISSB Commo System QSO Party—CW**
Mar 17-18	**Bermuda Contest**
Mar 17-18	**Spring QRP CW Activity Weekend**
Jul 13-15	**A5 International SSTV-DX Contest**
Aug 11-12	**New Jersey QSO Party**
Aug 24-27	**A5 North American UHF FSTV-DX Contest**
Sep 22-23	**Late Summer QRP CW Activity Weekend**

RESULTS

1983 ARIZONA QSO PARTY CERTIFICATE WINNERS

Call	QTH	Score
ARIZONA STATIONS		
K6LL	Yuma County	75,468
KB7KZ	Pima County	16,965
NON-ARIZONA STATIONS		
W5PWG	Texas	200

EXCHANGE:

QSO number and state, province, country, or two-letter designator for Vermont county (AD, BE, CA, CH, ES, FR, GI, LA, OE, OS, RU, WA, WM, WR). Do not send RS(T).

FREQUENCIES:

Phone—3910, 7230, 14260, 14320, 21360, 28570, 50.110, 144.2.

CW—3530, 3730, 7030, 7130, 14060, 21060, 21160, 28060.

RTTY—3620 and **090 other RTTY subbands.

SCORING:

Score one point per phone contact, 2 points per CW or RTTY. Vermont stations multiply QSO points by number of states plus Canadian provinces plus ARRL countries (exclude US/Canada). Others multiply QSO points by the number of Vermont counties (14 max.).

AWARDS:

For non-Vermont stations, certificate to highest-scoring station in each state, province, and country. Certificates will be given each Vermont station submitting a log; annual plaque to highest-scoring Vermont station. W/VT Award given to stations working 13 of Vermont's 14 counties.

ENTRIES:

Send an SASE for official log and score sheets. Send logs/facsimiles, name, class of license, and address not later than March 1 to: D. Nevin KK1U, W. Hill, Northfield VT 05663. Include an SASE for a copy of the results.

NEW HAMPSHIRE QSO PARTY 1900 GMT February 4 to 0700 GMT February 5 and 1400 GMT February 5 to 0200 GMT February 6

Sponsored by the New Hampshire Amateur Radio Association. Stations may be worked once per band per mode. New Hampshire stations may work each other.

EXCHANGE:

Send RS(T) and country, ARRL section, or New Hampshire county, as appropriate.

FREQUENCIES:

Phone—3935, 3975, 7235, 14280, 21380, 38575, 50.115, 145.015.

CW—1810, 3555, 7055, 14055, 21055, 28055.

Novice—3730, 7130, 21130, 28130.

RTTY—3625, 7085, 14085, 21085, 28085.

SCORING:

New Hampshire stations score 1 point per QSO, multiplied by the number of ARRL sections plus countries plus New Hampshire counties. Others score 5 points per New Hampshire QSO times the number of New Hampshire counties worked.

ENTRIES:

Send your entry no later than March 15 to Pete Cantara K1IM, 19 Haverhill St., Hudson NH 03051. Include a large SASE for results.

DUTCH PACC CONTEST Starts: 1400 GMT February 11 Ends: 1700 GMT February 12

Use all bands, 160 through 10 meters on CW and SSB. No crossmode operations allowed. Each station may be worked only once per band regardless of mode. Operating categories include single operator, multi-operator, and SWL.

EXCHANGE:

RS(T) plus sequential QSO serial number starting with 001. Dutch stations will send their two-letter province abbreviation instead of a QSO number: GR, FR, DR, OV, GD, UT, YP, NH, ZH, ZL, NB, and LB.

SCORING:

Each QSO with PA, PB, or PI counts one point. Multiply QSO points by the number of provinces worked on each band (72 max.).

SWLS count one point per Dutch station heard and multiply by provinces heard on each band (72 max.).

ENTRIES:

As usual, a score calculation is required. Please use a multiplier column and insert multipliers only if new. A log must be signed for observations of the contest rules. SWL logs must contain condegroups given by the Dutch station and the foreign station worked with. Send logs no later than March 31 to: F. Th. Oosthoek PA0INA, PO Box 499, 4600 AL Bergen op Zoom, Netherlands.

A certificate will be awarded to each country winner in each category along with the second- and third-place stations provided that there are sufficient participants in that country. Certificates will also go to winners in each call district of JA, LU, PY, UA9/0, VE/VO, VK, W, ZL, and ZS.

BEACON

INDIANAPOLIS REPEATER ASSOCIATION

NEWSLETTER OF THE MONTH

We think that the *Beacon* is one of the best newsletters we've ever seen. Basically, it is *packed* with information: news notes, hamfest and club calendars, bylaw excerpts, net skeds, reports from members and other media, contest and DX info, League news, a membership application, and more. You name it and it's in the *Beacon*—and it's presented in a very neat, easy-to-read format. Congratulations to Editor Mike Head WB9ZQE and the Indianapolis Repeater Association. The *Beacon* is a real winner.

To enter your newsletter in *73*'s Newsletter of the Month Contest, send it to 73, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

AMERICA RADIO CLUB INTERNATIONAL DX CONTEST Starts: 0500 GMT February 18 Ends: 0500 GMT February 20

Any amateur station making two contacts with America Radio Club DX member operators during the two-day contest will be eligible to apply for the Special Silver QSL Award. Stations making three contacts will be eligible for the Special Gold QSL Award. Contacts must be made during the two-day period listed above. Suggested frequencies include all authorized frequencies in the 10-, 15-, 20-, and 40-meter phone and CW bands. Exchange RS(T) and QTH. SWL stations may also apply for this award on a heard basis. For special awards, send QSL and $2.00 in US funds or 6 IRCs to: America Radio Club QSO Contest, PO Box 3576, Hialeah FL 33013.

RESULTS

1983 DUTCH PACC CONTEST

USA WINNERS BY CALL AREA

	QSOs	Mult.	Score
K1KI	129	46	5934
WA2UDT	31	18	558
W3ARK	63	30	1890
W4VQ	106	37	3922
KN6O	8	5	40
N6ZX/7	11	7	70
WD8MGQ	28	20	560
W9OA	47	19	893
W6KZV	22	13	286

YL-ISSB COMMO SYSTEM QSO PARTIES Phone Starts: 0001 GMT February 18 Ends: 2359 GMT February 19 CW Starts: 0001 GMT March 17 Ends: 2359 GMT March 18

Use the General portion of all bands. Deadline for all logs, summary sheets, and comments is June 1. Entries should be addressed to: Rick and Minnie Connolly, Star Route 1, Crocker MO 65452. Individuals needing extra application and instruction forms send a 4 × 9 SASE to the same address.

CQ WORLDWIDE 180-METER CONTEST — SSB Starts: 2200 GMT February 24 Ends: 1600 GMT February 26

Operating classes include both single and multi-operator (maximum of 5 ops per station).

EXCHANGE:

RS plus QTH, state for USA, and province for Canada.

RESULTS

1983 A5 NORTH AMERICAN UHF-FSTV CONTEST

1	K6YGX/W6VCF	26,530
2	WB0ZJP	9,420
3	WB9MCF	5,440
4	W2WHK	4,520
5	KA0BVT	4,360
6	W2RPO	3,755
7	N2BJ	3,350
8	WA2CXW	2,815
9	WB2KGM	1,695

SCORING

Contacts with stations within own country are 2 points, other countries but same continent are 5 points, other continents are 10 points. KH6 and KL7 are considered countries.

Multipliers are each US state, VE province, and DX country. USA and Canada are *not* country multipliers. However, there are three VE1 provinces: New Brunswick, Nova Scotia, and Prince Edward Island. Final score is total QSO points times the sum of the multipliers. Maritime mobile scoring will be determined by the location.

AWARDS:

Certificates to the top scorers in each class in each US state, VE province, and DX country. Special plaques are also being awarded for top USA, Europe, and world scores.

PENALTIES:

Three additional contacts will be deleted from the score for each duplicate, false, or unverifiable contact removed from the log. A second multiplier also will removed for each one lost by this action.

Violation of the rules and regulations pertaining to amateur radio in the country of the contestant or the rule of the contest, or unsportsmanlike conduct, or taking credit for excessive duplicate contacts or multipliers will be deemed sufficient cause for disqualification. Disqualified stations or operators may be barred from competing in CQ contests for a period of up to three years.

ENTRIES:

Sample log and summary sheets may be obtained from *CQ* by sending a large SASE with sufficient postge to cover your request. It is not necessary to use the official form, you can use your own. Logs should have 40 contacts per page and show time in GMT, numbers sent and received, and separate columns for QSO points and multipliers. Indicate the multiplier only the first time it is worked.

Include a summary sheet with your entry showing the scoring and other essential information, and a signed declaration that all rules and regulations have been observed. Mailing deadline for SSB entries is March 31. Logs can be sent directly to the 160 Contest Director, Don McClenon N4IN, 3075 Florida Avenue, Melbourne FL 32901 USA. Alternatively, they can be sent to CQ 160-Meter Contest, 76 North Broadway, Hicksville NY 11801 USA. Please indicate "SSB" on the envelope!

3RD ANNUAL RTTY WORLD CHAMPIONSHIP 0000Z to 2400Z February 25, 1984

SPONSORED BY:

73: Amateur Radio's Technical Journal and *The RTTY Journal*.

OPERATOR CLASSES

(A) Single operator, single transmitter. (B) Multi-operator, single transmitter.

ENTRY CATEGORIES

(A) Single band. (B) Allband, 10-80 meters.

MISCELLANEOUS RULES

The same station may be worked once on each band. Crossmode contacts do not count. Single-operator stations may work 16 hours maximum, while multi-operator stations may operate the entire 24-hour period.

Off times are *no less* than 30 minutes each and must be noted in your log(s).

EXCHANGE

Stations within the 48 continental United States and Canada must transmit RST and state or province/territory. All others must transmit RST and consecutive contact number.

QSO POINTS

5 QSO points for contacts with W/VE stations located within the continental United States and Canada. 10 QSO points for all other contacts.

MULTIPLIER POINTS

1 multiplier point is awarded for each of the 48 continental United States (a District of Columbia contact may be substituted for a Maryland multiplier). Canadian provinces/territories, and DX countries worked on each band (excluding US and Canada).

FINAL POINTS

Total QSO points times total multipliers equals *claimed score*.

CONTEST ENTRIES

Entries must include a *separate* log for each band, a dupe sheet, a summary sheet, a multiplier checklist, and a list of equipment used. Contestants are asked to send an SASE to the contest address for official forms.

ENTRY DEADLINE

All entries must be postmarked no later than April 15, 1984.

DISQUALIFICATIONS

Omission of the required entry forms, operating in excess of legal power, manipulating scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS

Contest awards will be issued in each entry category and operator class in each of the US call districts and Canadian provinces/territories, as well as in each DX country represented. Other awards may be issued at the discretion of the awards committee. A minimum of 25 QSOs must be worked to be eligible for awards.

CONTEST ADDRESS

RTTY World Championship, c/o *The RTTY Journal*, PO Box RY, Cardiff CA 92007.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

QATAR

One of several tiny countries around the Persian Gulf, Qatar's chief claim to fame is its black, gooey, crude oil under a barren landscape. Actually, Qatar is a peninsula sticking into the Persian Gulf from Arabia, not far from the island country of Bahrain. Most of Qatar's 4000 square miles are barren sand and low hills; annual rainfall is about 5 inches. Most of the country's 170,000 inhabitants live in the capital city of Doha.

As are most Middle Eastern countries, Qatar is antagonistic toward strangers. These countries are highly suspicious of foreigners and not only discourage but actually prohibit most visitors. (Consider Iran's feelings toward Americans, for example.) DXpeditions and amateur operations by foreigners living in these countries are seldom permitted, and few of the native amateur operators spend much time handing out DX contacts or QSL cards. So the report of an American with a well-equipped station active from Qatar is good news indeed.

Mike Smedal A71AD (Photo A) is the first foreigner to receive an amateur-radio license since the country became independent 14 years ago. To qualify for the license, Mike had to show that he worked and lived in Qatar, and he had to pass a security clearance. That done and the $250 license fee paid, A71AD was on the air.

Mike's station includes a Yaesu FT-1 transceiver feeding a Yaesu FL-2100Z amp. When conditions get a little rough, Mike runs the output of the Yaesu amp into an export version of Alpha's 77SX amplifier! The antenna farm is also first class (Photo B): a Hy-Gain TH7DDX above a Hy-Gain 402BA two-element 40-meter beam. An inverted V provides 80-meter coverage. Mike says that the TH7 handles the high-power levels without difficulty. Mike runs RTTY on his Radio Shack TRS-80 Model I and is active on OSCAR, too.

The best times to look for Mike (and other Middle Eastern amateurs) are Thursday evening and Friday. The work week is six days long in Qatar, with Friday (the Arab holy day) as the day off. So their equivalent to our weekend is Thursday night and Friday.

On the subject of QSL cards, Mike writes, "Please tell everyone that we do not have a radio club in Qatar. Therefore, we do not have a QSL bureau. If [DXers] want a QSL card, please QSL direct to PO Box 4747, Doha, State of Qatar, Middle East."

SAUDI ARABIA

An exception to the no-visitor policy of the Middle Eastern countries was made for the recent visit of Lloyd and Iris Colvin, W6KG and W6QL, of Yasme DXpedition fame. The Colvins managed not only to visit most of the countries in the region, but also actually obtained permission to operate in many of them.

Iris faced special problems in Saudi Arabia. Women occupy a very special role in the Arab world, quite different from that in the more liberal Western nations. Women are seldom seen out in public, and then only heavily veiled. Those few women who do venture out of doors find themselves escorted to the head of the line and receive other special attentions. On the other hand, an unveiled woman in Saudi Arabia faces a nasty surprise from the local authorities.

Saudi policemen carry two items on their belts: a can of black spray paint and an ice pick. Upon seeing a woman with bare face or arms, the policeman will, very politely, spray black paint over the exposed skin! (The ice pick sees similar service in the Saudi's swift, uncomplicated justice system. Illegally parked automobiles are not ticketed or towed. The policeman simply stabs all four tires with the ice pick!) And petty theft is unknown; the Saudis still cut off the hand of an offender.

Photo A. Mike Smedal A71AD in his well-organized and well-equipped shack in Doha, Qatar.

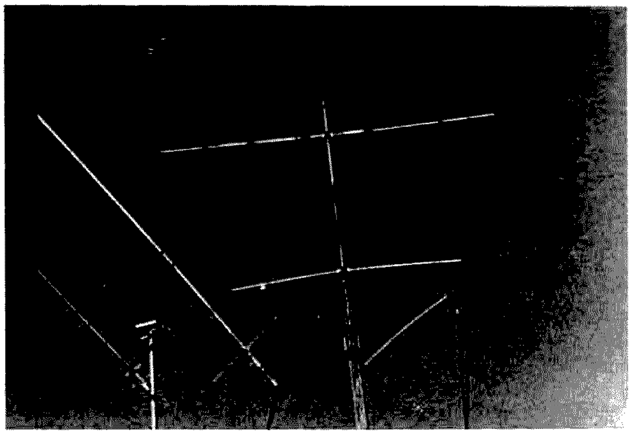


Photo B. The antenna farm at A71AD, including a TH7 and 2 elements on 40 meters. In the foreground are the Oscar 10 antennas.

In the amateur-radio field, most of the local hams are big wheels in the government or are in the Saudi family, which is the same thing. With the billions of dollars flowing into the country as the oil flows out, Saudi hams can afford good equipment. One local ham employs a graduate electronics engineer just to maintain his amateur-radio station!

However, the Saudi princes aren't likely to spend much time running stateside hams in pileups. One of your best bets to work Saudi Arabia is HZ1AB, the amateur-radio club at the American compound on the Persian Gulf, which is home in Saudi Arabia for about 50,000 foreigners. HZ1AB is another first-class station, with Collins S-lines, amplifiers, and a substantial antenna farm. The latter includes a rhombic, rotatable KLM tribander and a 2-element beam on 40 meters. The Colvins operated the ARRL CW DX Test from HZ1AB, but could work the States for only about 7 hours a day.

Among the regular operators of HZ1AB are Dave Ernest W7SE and N6OL. QSL the station through K8PYD, except for the February 19-20, 1983, operation by the Colvins, which is confirmed via Yasme, Box 2025, Castro Valley CA 94546.

QRO—EXCESSIVE POWER

Lloyd and Iris Colvin stopped by Houston between DXpeditions this past fall. At the International DX Seminar, held in conjunction with the ARRL National Convention, the Colvins joined several other prominent DXers and contesters on the panel discussion of excessive power in amateur radio. The problem of excessive power drew a large and interested crowd to hear the DXers discuss alternative solutions.

The seminar opened with a discussion of what we mean by "excessive power." Under the old FCC regulations, any amplifier was restricted to a maximum of about 800 Watts output. However, many of the "standard" off-the-shelf amplifiers openly sold in the amateur community were capable of significantly greater power levels, often 50% more. Active contesters and DXers owned amplifiers capable of running power levels above the FCC maximum because of the greater dependability and longer lifetime of an "over-rated" amp. A 1000-Watt amplifier running 1000 Watts all the time won't hold up as well as a 2000-Watt amp coasting along at half power.

However, there was always a strong temptation, particularly in DX pileups and contests, to run the amp flat out. "Tuning

Photo C. Gene Zimmerman W3ZZ (standing) makes a point at the Excessive Power seminar of the First International DX Symposium, in Houston. Al Slater G3FXB (left) and Bob Ehrhardt YS9RVE listen intently.

for maximum smoke" is the usual practice, and many amateurs have run "excessive power" for years. Under the new FCC power regulations, most of these amplifiers have been "grandfathered" into legality.

But there is a greater problem in excessive power than squeaking out a couple extra Watts over the legal limit. While some amateurs are still saving their bucks for a better antenna, some hams have quietly been installing *real* high-power amplifiers, amps that require 500–1000 Watts of *drive*.

The Houston seminar turned to the problem of what to do about that small number of amateurs who run super-power. Frequent contester (and occasional DXpeditioner) Gene Zimmerman K3ZZ (Photo C) suggested that the current rules about power during contests be changed. Gene recommended that inspectors stop by the shacks of hams seriously involved in the contest and look at the amplifiers. If any amp had final plate dissipation (or the transistor equivalent) of more than 1600 Watts, the contestant would be disqualified. He reasoned that if you don't have an amp capable of running excessive power, you won't run it! The same idea holds for DXers, of course, with the offending amateur losing the right to participate in DXCC, for example.

Al Slater G2FXB (Photo C) talked about a similar program used by the Radio Society of Great Britain for their Field Day, which is even more popular there than the same activity on this side of the Atlantic. The RSGB requires each Field Day team to register before the contest and include their operating locations. During the contest, a volunteer RSGB inspector stops by and checks that the group is meeting their strict rules of 30 Watts maximum input power!

This 30-Watt limit poses special problems for British amateurs; most standard transceivers have little or no output at the 30-Watt input level. So the G hams build special final amplifiers designed for maximum output with 30 Watts of input power. These simple amps often are fed with a 100-Watt output transceiver and are run so close to the limit that some groups change final tubes every hour of the contest!

The question of high power is of special interest to Al, who spends much of his time on 160 meters, where the British hams face a 10-Watt power limit. Al said the government licensing authorities no longer worry about power and have suspended their station inspections. Most hams run a full 200 Watts on 160 meters, and 2000-Watt amplifiers are not unknown.

In other comments on the high-power question, panelist Ellen White W1YL felt that the contest rules already permit disqualification of anyone running illegal power. On the other hand, Ellen felt that the idea of inspectors coordinated from League headquarters would be unworkable. Ellen favored handling excessive-power users at the local level, by drumming them out of the local DX club, for example.

Both Iris and Lloyd Colvin recommended increasing the existing power limits as a means to eliminate the "excessive-power" problem. Lloyd particularly suggested higher power limits on the lower frequencies, including .160. Iris noted the advantages of high power on DXpeditions, when the power helps to control the pileup. If the stateside stations calling can't hear the DX station very well, the rate of contacts drops and fewer hams get a chance to work the DX station.

Several members of the audience took exception to the idea of ever-increasing power limits. Tod Olsen KØTO disagreed with the concept of letting the manufacturers of amateur equipment decide what the legal or moral limits to excessive power should be. "Just because it is openly sold to hams doesn't mean that the power level is acceptable." Dick Norton N6AA felt that in the contest field the power level doesn't really matter as long as the final contest results are not affected. But if someone wins the contest or moves ahead of a legal power station by running excessive power, he should be disqualified.

I have my own definition of "excessive power." The FCC amateur regulations state that amateurs should always use the minimum power necessary for the communications. So two hams talking across town on 20 meters don't need the amplifiers, much less the excessive-power amps. And frankly, even a few thousand Watts of power cannot compensate for bad operating techniques or inadaquate antennas.

How much power is *really* needed for amateur communications? Listen any time to 14100. A series of beacons all over the world ticks down every ten minutes with ever-lower power levels. See how far down into the mud you can copy the beacons' signals. We'll be talking more about this beacon network and other propagation aids and suggestions in future issues. Stay tuned. Meanwhile, keep an ear out for some of these coming attractions.

Photo D. Jim Smith VKØNS is aiming for Kermadec Islands this season, after his event-filled DXpedition to Heard Island last year.

COMING ATTRACTIONS

The DXpedition circuit continues to hum in February, with two major expeditions scheduled for the month. Jim Smith VKØNS (Photo D) is spearheading an amateur and scientific DXpedition to the Kermadec Islands, a small, sparsely-inhabited group of volcanic islands about halfway between New Zealand and Tonga. Under the control of New Zealand, they have no special amateur call prefix.

The Kermadec Islands have been slowly moving up in the Most-Wanted-Countries list and now rank 17th, up with Spratly, Laos, and Clipperton. This DXpedition should satisfy a good chunk of that demand, with several operators and plenty of time on the island.

Jim Smith organized the Heard Island DX Association trip to Heard Island last winter and hopes for fewer problems on this year's DXpedition. Jim is also looking for donations for the trip and memberships in his Heard Island DX Association. Contact Jim via PO Box 90, Norfolk Island, South Pacific 2899.

Also scheduled for this month is a DXpedition to Aves Island, halfway around the world in the Caribbean. Isla de Aves (The Island of Birds) is a tiny part of a submerged reef about 150 miles west of the Windward Islands. The island is under the control of Venezuela, and the Venezuelan military restricts access most of the time.

The island itself is only about 1500 feet long and about 400 feet wide at the largest. Its maximum ten-foot elevation means it really is a large rock out in the middle of the ocean. Whenever the waves or tides are high in the Caribbean, landing on Aves is impossible. Only during a short period in mid-winter do calm conditions permit amateur operations.

Because of the restrictions and landing problems, DXpeditions to Aves are few and far between. Any station on the island is easy to work from the States, thanks to the excellent propagation from that part of the world. (Why do you think I lived there?) But you won't want to miss this DXpedition, as the next one might be years down the DX road. And Aves is already in the top 30 most wanted.

The DXpedition is sponsored by the Radio Club Venezolano, which is celebrating its 50th anniversary this year. The callsign on Aves will be YVØAA, with QSLs handled by YV5DFI, PO Box 50332, Caracas, Venezuela 1050-A, South America.

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½" x 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye," and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

I'm looking for a schematic for a Lavoie oscilloscope, model no. LA265A. I will pay for copying and mailing costs.

L. C. Hocutt WE4O
4257 Via Alta Dr.
Mobile AL 36609

I am interested in obtaining the vox relay that plugs into the back of the Swan 700 transceiver. I would appreciate hearing from someone who may have one of these lying around that they don't have any future use for.

Augustus B. Wells
PO Box 50
Tunica LA 70782

I am looking for a copy of the instruction booklet for the Knight KG670 R/C tester made by Allied Radio. I will pay the costs for copying and mailing or for the original manual.

Lionel Roach KD5VO
3033 Teakwood
Garland TX 75042

Wanted: Collins 70E-7A PTO (permeability-tuned oscillator) for a Collins 75A1 receiver. This PTO covers 2-3 MHz and is used to tune the receiver.

Harold Smith W2GKE
26 Linden St.
Bayonne NJ 07002
(201)-436-1405

I am using the VIC-20 as a RTTY terminal with Kantronics interface and software. Can anyone help me with information on building an adapter which would let me use Atari cartridges on the VIC-20?

Robert F. Cann W4GBB
1606 Lochwood Dr.
Richmond VA 23233

I would appreciate receiving a copy of the schematic for an NCX-3 SSB/CW transceiver by National. I have the owner's manual already. I will gladly reimburse for costs.

Jeffry M. Blackmon W2YI
2107 Turnbull Road
Beavercreek OH 45431

I need the schematic for the Model TV-7D/U tube tester.

Stan LaDage W2EZM
431 Oakland Ave.
Maple Shade NJ 08052

I want to replace the tubes in my Collins R-392 receiver with solid-state devices. Any information on replacement parts would be greatly appreciated. I also need information on the R-392 Club and sources for 2-kHz filters for the Collins R-390A.

J. P. Barnes G6AHN
2 Mappins Rd.
Catcliffe, Rotherham
South Yorkshire S60 5TH
England

✓ See List of Advertisers on page 98

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 6

lem was not unique, that indeed the problem was universal and probably at the root of the general dislike of cocktail parties. I have a problem there. While I may hate meeting people and being expected to be entertaining on demand, I can't stay away from the food. I think I'd take a plane to the Shetland Islands if they promised me an interesting meal.

Much of my life has been an extended diet interspersed with fantastic meals which make the dieting even more imperative. About ten years ago I got fed up, if you'll pardon the expression, and went on a diet for about nine months. I lost 85 pounds, going from 250 bloated pounds down to 165. What an un-orgy that was! These days I hang around 175, not looking too fat, but feeling ten pounds overweight and guilty when gorging on ice cream, cake, and such.

Getting back to my ego: I wonder if my hopes to inspire you to greater things come across as ego? I delight in getting letters from people who have several basic drives: One is to educate and another is to share my enthusiasms. You may have noticed that all of my magazines are both educational and fun—expressions of my drives.

I don't *believe* that you can make all of the money you want, I *know* it. I hate it when I get letters complaining that, gee, I can't afford your magazine, a new rig, or something. What rot! There are so many ways to make money these days that just about anybody who wants to can do it . . . from kids right up to the retired.

No, if you are going to pursue a life goal of swilling several thousands of gallons of beer and seeing every Monday-night football game, you're a loser. You don't get rich very often without working hard at it. But you have to work with some goals in mind. A lot of people work their butts off and never get anywhere. The brutal fact is that, though not by any conscious design, this is the normal pattern. You do have to outwork the average person to make it big.

Why am I getting ready to invest several million dollars in a college? Here we are at a time when colleges are going out of business all around the country and I want to start a college! Dumb or shrewd? Well, I think I have a plan which will teach kids to become entrepreneurs and to beat the system. The end result will be a bonanza for our country and a few thousand more millionaires. Everyone will win.

There's Wayne's ego again? Well, perhaps—yet I've gone over my idea with the presidents of ten colleges now and haven't yet found one who doesn't think it will work. I'm getting quite a bit of support.

The average *73* reader is way above the average person in this country. It isn't easy to get a ham ticket, even with the Bash method, so that's a filter. And beyond that, the average *73* reader is another step ahead of the average ham just by virtue of his interest in keeping up with technology. The ham who does not read *73* has far less of an opportunity to be a success just because he doesn't take advantage of this remarkable resource.

From that aspect, I really feel sorry for the foreign hams who can't afford *73* or who are prohibited from subscribing because their money can't be sent away.

Most of my time is spent these days looking for people to help me with my projects. I really need help—enthusiastic, non-smoking help. My editorial a few months ago discussed this and resulted in a couple hundred letters. Some of those people are already here in Peterborough helping me get new projects started.

One enterprise, a franchise chain of software stores, is getting started. I have a whole new approach to the business which should make it possible for several thousand people to make an awful lot of money. It's an ingenious concept that no one else has thought of yet, so we have a very good chance, despite the recent proliferation of software stores.

Software Production Devices, Inc., is also moving along on schedule. This isn't my idea, but when I saw what two chaps from Bangkok had come up with and realized how desperately the computer industry needs the product, it seemed like a good investment. Indeed, I know of no other practical appoach to software protection, and I think I know 'em all.

I have several new magazines in mind which are needed, each to help a new industry to grow just as *Byte* and *Kilobaud* helped the microcomputer industry to flower. Magazines can't be started unless I have editors, writers, ad sales, circulation, administration, typesetting, production, photography, accounting, data processing, promotion, and so on. It takes about 25 people (minimum) to make a magazine work, and between the seven magazines we have now, the two of McGraw-Hill, and a half dozen others in the area, we've just about cleaned out southern New Hampshire of available talent. Interested?

A surprising number of the people we've been hiring of late are hams, fliers, and computerists—quite a combination for success, I suspect.

And speaking about proj-

ects, a chap who used to work for me started his own computer mail-order business here in town and is already doing well over a million in sales per year. He started out with a small ad in *inCider*, my Apple magazine, and went over the million mark in sales the first month. I talk with him often. . .on the street, at the Folkway for lunch, or when he stops by my office.

He's a success because he did his homework and then had the guts to give it a try. The failures are those who spend their time watching TV, gossiping on the air, and wasting their lives. What a pity! Thousands of hams have used the hobby to get the technical smarts to develop new products and go into business with them. It only takes one good idea to make it.

That's one of my problems. I spend a good deal of my time staying abreast of the technology in communications and computers, with the result that I have a bright idea a day for a business. . .and a terrific idea a week. I lack only the people to help me make these ideas bear fruit.

A chap from Texas visited a few days ago. A ham, of course, a flier, and a computer nut. He was fascinated to see the high energy here, the people all working hard and obviously having one hell of a time. Sure, it's like a rabbit warren, but it's fun and very productive. People come here, often with little background, and they learn fast. Yes, he signed on and is moving here.

He found just what he wanted in a house in a couple of hours and is busy moving up here to help me start a new magazine. He's going to need a bunch of people to work with him. . .what are *you* doing? We're going crazy for people to help set type, paste up pages, shoot the pages into negatives, handle the circulation, and so on.

One of the new magazines I want to start will have as a goal the generation of several thousand new hams a year—maybe as many as 50,000 or even double that. No, I don't know of any way to let you work from home—you really have to be here.

Well, if you are all set with what you are doing, at least say hello on the air. I get a couple hours a week on 20m and my ego will be looking for you.

SATELLITES

PROJECT OSCAR

Project OSCAR, Inc., has prepared a new set of orbital predictions for the period covering the calendar year 1984. The predictions provide the UTC times and longitude for all south-to-north equatorial crossings of the 4 Russian satellites carrying Mode A transponders (RS5, RS6, RS7, and RS8). In addition, the UTC time and sub-satellite latitude and longitude are given for the apogee of each orbit of AMSAT OSCAR 10 (AO-10). This document, when used with the appropriate plotter, allows the user to determine the access times to all the presently available amateur-radio satellites carrying communication transponders.

The large expense incurred in producing and disseminating a calendar of this magnitude necessitates a request for a minimum donation of $10 for mailings to the US, Canada, and Mexico ($12 for all overseas mailings). To receive your copy of this set of orbital predictions, send a completed mailing label along with a check or money order payable to Project OSCAR, Inc., POB 1136, Los Altos CA 94022. The donation covers the cost of first-class mailing within the US, Canada, and Mexico, and airmail printed matter to overseas destinations.

Amateur Satellite Reference Orbits

		OSCAR 8		RS-5		RS-6		RS-7		RS-8		
	Date	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	Date
Feb	1	0045	103	0114	292	0119	300	0058	291	0155	300	1
	2	0049	104	0109	293	0104	298	0048	290	0153	301	2
	3	0054	105	0103	293	0049	296	0039	289	0150	301	3
	4	0058	106	0058	293	0033	294	0029	288	0147	302	4
	5	0102	107	0053	293	0018	291	0019	287	0144	303	5
	6	0107	108	0047	293	0002	289	0010	286	0141	304	6
	7	0111	110	0042	293	0146	316	0000	285	0138	305	7
	8	0115	111	0037	294	0130	314	0150	314	0136	305	8
	9	0120	112	0031	294	0115	312	0140	313	0133	306	9
	10	0124	113	0026	294	0059	309	0130	313	0130	307	10
	11	0128	114	0021	294	0044	307	0121	312	0127	308	11
	12	0133	115	0015	294	0029	305	0111	311	0124	309	12
	13	0137	116	0010	295	0013	302	0101	310	0121	310	13
	14	0141	117	0005	295	0156	330	0052	309	0119	310	14
	15	0002	93	0159	325	0141	327	0042	308	0116	311	15
	16	0007	94	0154	325	0126	325	0032	307	0113	312	16
	17	0011	95	0148	325	0110	323	0023	306	0110	313	17
	18	0015	96	0143	326	0055	321	0013	305	0107	314	18
	19	0020	97	0137	326	0039	318	0003	305	0104	314	19
	20	0024	98	0132	326	0024	316	0153	334	0102	315	20
	21	0028	99	0127	326	0009	314	0143	333	0059	316	21
	22	0033	100	0121	326	0152	341	0134	332	0056	317	22
	23	0037	102	0116	327	0137	339	0124	331	0053	318	23
	24	0041	103	0111	327	0121	336	0114	330	0050	319	24
	25	0046	104	0105	327	0106	334	0105	329	0047	319	25
	26	0050	105	0100	327	0050	332	0055	328	0045	320	26
	27	0054	106	0055	327	0035	329	0045	327	0042	321	27
	28	0059	107	0049	327	0019	327	0036	326	0039	322	28
	29	0103	108	0044	328	0004	325	0026	326	0036	323	29
Mar	1	0107	109	0039	328	0147	352	0016	325	0033	323	1
	2	0112	111	0033	328	0132	350	0007	324	0030	324	2
	3	0116	112	0028	328	0117	347	0156	353	0028	325	3
	4	0120	113	0023	328	0101	345	0147	352	0025	326	4
	5	0125	114	0017	329	0046	343	0137	351	0022	327	5
	6	0129	115	0012	329	0030	341	0127	350	0019	328	6
	7	0133	116	0007	329	0015	338	0118	349	0016	328	7
	8	0138	117	0001	329	0000	336	0108	348	0013	329	8
	9	0142	118	0156	359	0143	3	0058	348	0011	330	9
	10	0003	94	0150	360	0127	1	0049	347	0008	331	10
	11	0008	95	0145	360	0112	359	0039	346	0005	332	11
	12	0012	96	0140	360	0057	356	0029	345	0002	332	12
	13	0016	97	0134	0	0041	354	0020	344	0159	3	13
	14	0021	98	0129	0	0026	352	0010	343	0156	4	14
	15	0025	99	0123	1	0010	349	0000	342	0153	5	15
	16	0029	100	0118	1	0154	17	0150	11	0150	6	16

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73 INTERNATIONAL

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trix printer), I am obviously not a fan of mechanical systems. I was surprised, therefore, to note that 60% of traditionalists plan to keep their mechanized RTTY.

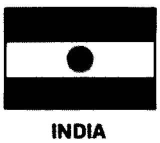
As more and more computers come into amateur-radio shacks, so the desire for higher transmission speeds takes on a more urgent note. After years of watching news agency reports print at 50 baud, the thought of 300 (or even 1200) baud is indeed enticing. A problem with the existing *de facto* amateur data-transmission standard (CUTS or Kansas City) is that it uses harmonically-related tones which will give very poor results in conditions of low signal-to-noise ratio.

BARTG has therefore proposed (for consideration at the IARU region conference in 1984) that existing RTTY standards be used as follows—300 baud, 170-Hz shift; 1200 baud, 850-Hz shift. FSK transmissions will have space on the lower radio frequency and AFSK will use 1275 Hz for space and 1445 Hz (170-Hz shift) or 2125 Hz (850-Hz shift) for mark for 300 baud or 1200 baud, respectively.

Further BARTG proposals for the conference include:

- The adoption of a 10-bit ASCII code using even or indeterminate parity (plus 1 start, 7 data, and 1 stop). (Author's note: Many commercial systems use 11 bits for asynchronous ASCII by adding a second stop bit.)
- The adoption of CCIR 476-1 at 100 baud (the basis of AMTOR) as the international amateur standard for an error-correcting code.
- Standard amateur RTTY speeds of 50, 75, and 100 baud (note the dropping of 45.45).
- Dropping the requirement that amateur RTTY stations regularly transmit voice or CW identifications when using CCITT alphabet no. 2 (Baudot).
- The adoption for amateur mailbox operations of the protocols used for Viewdata (Videotex).

I find the last proposal rather odd and think it is almost a backward step! Viewdata does not use error-correction and is asymmetric (uses different speeds in the forward/return directions).



INDIA

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India

A VISITING HAM'S GUIDE TO INDIA

The time is gone when the mention of India conjures up visions of snake charmers, elephants, and maharajas. All these are there, but there is much more of interest to the visitor—ham radio, for instance.

Those who believe that India is a backward country are in for a jolt. Your first exposure to India will, of course, be the airport (or the seaport, if you are the M/M type). Modern communications and facilities at these entry points convince the visitor that he has come to yet another advanced country. What, then, is this talk about underdeveloped and developing countries? That is for consumption by the World Bank and other UN organizations. Yes, we do have a lower *per capita* income, but everything is cheap in the same proportion. In brief, you can live in India on as many rupees as you would need dollars living in the US for a comparable standard of living. India builds its own nuclear power plants and launches its own satellites on its own rockets—a little late, but with the technological advantages of the state of the art. Soon, Indian hams will be using a satellite built by them and launched for them by the Indian Space Research Organization. It will probably be called the Indamsat—such an appropriate acronym!

So, you probably landed in Bombay on a Pan Am flight. Bombay has over 200 callsigns and most of them are members of a club called the Radio and Electronics Society of India. One of the dream shacks is that of Capt. D. Dasan VU2AID, a senior manager in Air India who also holds the Australian call VK6IK. Most shacks in Bombay have Icom or Kenwood equipment, thanks to VU2RX (who represents these two companies). Quite a few of them sport quads or tribander beams. Activity is mostly on the 14-, 21-, and 28-MHz bands. 2 meters is just getting started, but it will take a repeater to really turn this band on. It won't be long before one is installed. The calling frequencies are 145.0 and 145.5 MHz all over the country.

There are more than 50 callsigns in Delhi, but quite a few are inactive. The active calls were Bernd VU2LQA from the German embassy, Aoki VU2JPN from the Japanese embassy (both of whom have left India), and brothers Rakesh VU2RAK and Rahul VU2YK, who are still in Delhi. Brad VU2USE from the American embassy was active, but he has now been posted to some other country.

Madras has its share of active hams, including Chauhan VU2MV, President of the Federation of Amateur Radio Societies of India (FARSI), who uses a Ten-Tec Delta. Equipment in the Madras shacks is mostly Heath, Ten-Tec, and Yaesu. In this city of 4 million, you will find the pace of life brisk but not breakneck. Hams here will find time for a friendly chat with you, even if you arrive unannounced. Avoid morning visits if you can, except on holidays. Life begins early—around 5:00 in the morning—and most hams are at work (known in India as morning QTH) by 8:30. Most of them can receive visitors at their place of work and in any case can be got at on the telephone. The 2-meter net meets on 145.5 at 0800 and 2000 hours daily.

Bangalore, promoted as the Garden City of India, is about the same as Madras, except that work for many begins at 7:00 in the morning. The Bangalore boys are back home by 5 in the evening even after commuting tens of miles. Many of these are not available by telephone, but put your 2-meter rig on scan and you may meet many of them.

If you are planning a short visit of a few weeks to India, you will probably not have enough time to obtain a reciprocal license. You can, however, operate from an Indian shack with the permission of the OM, and you can save the trouble of bringing along your shack. However, the path towards W opens up at an inconvenient time for working hams (around 1100Z), so unless you plan to operate from a pensioner's shack, it is likely that you will get to everywhere except your homeland!

In the event that you are planning to have a home in India for a few months, you can apply for a license about the same time that you apply for a visa. Your application should be addressed to the Wireless Adviser to the Government of India, Dept. of Communications, WPC Wing, Sardar Patel Bhavan, Sardar Sq., Parliament Street, New Delhi 110 001. The application form can be obtained from that office or more promptly by writing The Federation of Amateur Radio Societies of India, 3 Thiru-Vi-Ka Road, Post Box No. 725, Madras 600 006, India (include 3 IRCs to cover postage). A self-addressed envelope will further speed up action; the forms will be posted the same day as your letter is received in India. Send 10 more IRCs if you want a copy of the Indian *Callbook* (which also contains telephone numbers).

You need not send money with your application, but do send a copy to the Federation. When you get your visa, write a letter to The Wireless Adviser to the Government of India, confirming that you got it. Send a copy to the Federation. You will normally get the license by the time you arrive in India, although much depends upon the workload in the licensing department at the time of your application.

The power allowed in India is 150 Watts rf output to antenna, which covers any barefoot transceiver other than the KWM2. Unless you are holding a Novice license, you will be allowed the use of the following bands: 7.000-7.100 MHz; 14.000-14.350 MHz; 21.000-21.450 MHz; 28.000-29.700 MHz; and 144-146 MHz.

The Indian government is extremely friendly towards amateur radio and foreign amateurs. If there is a delay in response to your application, interpret it generously as resulting from excessive workload. Once in a while the government may turn down your application. The reason will probably be the same as when the US embassy turns down an Indian application for a visa to visit the US. You cannot fight Capitol Hill, so resign yourself to operating from an Indian shack if your visa is not also refused. In the latter event, the problem neatly solves itself!

Now that you have a fairly good idea of what to do, plan your next vacation in India. Air India is a good airline and will be pleased to be of service if you choose to fly with them. You might even run into Capt. D. Dasan VU2AID, their operations manager, Vice-President of FARSI, on one of the jumbos or at one of the airports.

•••••

NEW OPERATING FREQUENCIES FOR HAMS

The government of India has authorized the following operating frequencies for VU2 hams. Certain frequencies as indicated (*) are shared with other services: 3500-3540* kHz; 3890-3900 kHz; 7000-7100 kHz; 1400-14350 kHz; 18068-18168* kHz; 21000-21450 kHz; 24890-24990* kHz; 28000-29700 kHz; and 144-146 MHz.

The type of emission allowed to grade II operators in the band up to 24.900 MHz is A1 only with 50 W maximum dc input power. On 28-29.7 MHz, A1, A3, A3A, A3J, and A3H are permitted. On 144-146 MHz, A3, A3A, A3J, and F3 are permitted with a power limit of 10 W.

For grade I license holders, A1, A3, F3, A3A, A3J, A3H, F1, F2, F3, and A5 are permitted on the HF band; A2 is permitted, in addition to the above, for the VHF band. Power is limited to 150 W in the HF band and 25 W in the VHF band for terrestrial and satellite work.

For the advanced amateur telegraph

N. L. Krishnan of Bharat Electronics.

station, A1, A3, A3A, A3J, A3H, F1, F2, F3, and A5 operations are permitted in the HF bands (with power limited to 150 W). Also, A1, A2, A3, A3A, A3J, F1, F2, F3, F4, A3H, A4, and A5 operations (with a power limit of 50 W for terrestrial and 100 W for satellite-working) are permitted.

VU2BEL

The Managing Director of Bharat Electronics Limited (BEL), Mr. N. L. Krishnan, has promised to help their club station (VU2BEL) with all facilities and equipment. There are more than 40 hams on the roll of the establishment. In addition to the club building, the establishment has provided their communications equipment, test equipment, antenna systems, etc. Now it is left to the inclination and interest of the hams to exploit and utilize the facilities openly offered by the Managing Director. He has whole-heartedly said that he is willing to help hams with projects for the design and development of new amateur equipment, especially ham gear which can be produced and marketed so that the national market for ham equipment can evolve.

The photograph shows the Managing Director operating one of the transceivers manufactured by BEL and given to the VU2BEL club station.

ISRAEL

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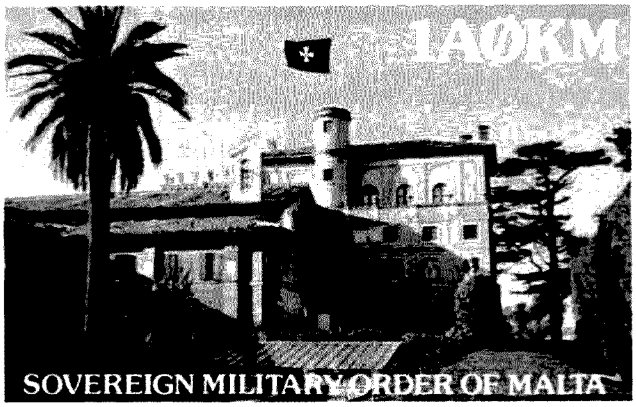
I hope that from the last few columns you haven't gotten the impression that the only amateur pioneering work being done here is in the VHF/UHF frontier. Yes, the lower end of the amateur spectrum is a new territory just beginning to be mapped here. You see, when in 1979 the World Administrative Radio Conference decided to expand the ham bands, the groundwork was laid for 160 meters to be opened up in this part of the world. So, for the hardy souls who brave the static-crash-torn reaches of the Top Band, we can now see what this band has to offer.

In the forefront of the pioneering effort here is Riki 4X4NJ of Gan Yavne on the Mediterranean coast about fifty kilometers south of Tel-Aviv. Riki's endeavors on 160 go back to pre-WARC years when, for the CQ Worldwide test in October, 1973, a special license was granted to set up a station. A full-size sloping dipole was hung from the top of the Four Seasons Hotel in Natanya, on a cliff overlooking the Mediterranean, and a Swan 160-meter transceiver on loan from VE3MR provided the means of exciting this effective antenna. From here on, Riki continued to experiment with this band from his own QTH, applying for special permission whenever an international contest would come up.

In October, 1982, along with 30, 17, and 12 meters, 160 became available to the Israeli radio amateur. 1810-1850 kHz may be used on a primary basis by Class A amateurs running a maximum of 100 Watts input and Class B operators with 10 Watts. 1850-200 kHz may be used by A licensees only on a secondary-non-interfering basis with 10 Watts input.

4X4NJ has since then worked all continents and run up the all-time record for Asia in the CQ WW contest. The credit must go to hard work, perseverance, and



The 1AØKM pictorial QSL card, showing the SMOM location, an ancient villa near the Tevere river which has been recognized as a national monument. For that reason, the tribander beam shown on the terrace (just right of the pine tree) had to be dismantled. A tilting-down five-bander vertical is now planned for the same terrace.

sparing no efforts on a good antenna system.

Riki began by loading the insulated guy wires of his 65-foot-high tower, resembling an inverted L sloping towards North America. Since then, the sky-wires have become more sophisticated, transmitting into a 100-foot wire hung from the top of the tower which is base loaded through a silver-plated coil. Sixteen 80-meter radials plus five quarter-wavelength 160-meter radials which are strung out temporarily over adjoining fields for contest weekends and assorted buried pipes comprise an effective ground system.

Receiving was at first the real problem: It was painstakingly difficult to dredge the far-off stations calling 4X4NJ out of the atmospheric noise. Thus, Riki switched between four different receiving antennas: the transmitting antenna plus attenuators, a horizontally-polarized omnidirectional dipole twelve feet up, a two-element vertical phased array composed of two twenty-foot elements with a rotatable pattern and remote transistor preamps, and an 80-foot-long non-terminated Beverage wire bi-directional to Europe and North America on one end and VK-ZL on the other. The Beverage, which Riki added last season, far outshone the previous receiving antennas, finding the North American stations, unreadable on the other antennas, were Q5 on this. This receiving antenna, added last winter, made it possible to hear better than Riki could be heard, so he decided that the next step in which to go was that of better transmitting effectiveness.

In early October, I got hold of Riki on the Tel Aviv repeater, and he told me of what appears to be his latest breakthrough. He recently completed a phased transmitting array with a very low angle of radiation and a rotary switch for selecting antenna direction. Construction details are being withheld until this antenna has been thoroughly tested out. Riki says that it appears to have a 15-to-20-dB front-to-back ratio and a forward gain of 6 to 10 dB. On receiving, it competes with the Beverage, and in certain instances actually outperforms it! Both G3BDQ and DJ8WL reported that he was coming in like a local, with a greatly improved signal, so Riki is expecting big things out of this antenna.

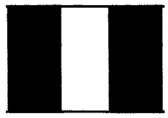
On the equipment end (notice that we've left this for last, as on 160, the antenna is what really makes the difference), Riki is using the Drake C-line, with a combination of i-f and af filtering to squeeze the weak signals out of the noise. At this time, 4X4NJ has worked on Top Band 72 countries (53 confirmed), 25 US states, and all continents.

We wish Riki best success on 160 this season, and hopefully some of you will have already made contact with him. There are other Israeli stations on 160 meters, but by far 4X4NJ is the most serious of all!

I would like to conclude this month by thanking all those who have taken the time to respond to this column, either by letter or on the air. It has been heartening for me to know that so many people are interested in what's happening in this country outside of the tense headline news. This underlines the human aspect of amateur radio that makes possible people-to-people contacts, bypassing international boundaries and tensions.

Until next month, Shalom (peace) and 73.

The 1AØKM crew. From left, standing: IØMGM, IØJX, IØAMU, IØMXM. IØIJ is sitting at the mike. The atmosphere of the very exclusive ham shack is enhanced by ancient and valuable pictures on the walls.



ITALY

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1AØKM—THE SOVEREIGN MILITARY ORDER OF MALTA HAM STATION

One of the most requested countries in the DXCC fan's world is the Sovereign Order of Malta, prefix 1AØ. This political entity, founded in 1099, recognized by Pope Pascal II in 1310, and known as SMOM—Sovrano Militare Ordine di Malta—is fully independent from the Italian state, and under the provisions of international law, it maintains diplomatic relations with many countries and international organizations. The main activity of the tiny political and territorial entity, which is located in a beautiful spot of Rome near the Tevere River, is concerned with worldwide assistance in the sanitary and social fields.

The 1AØKM station was activated in November, 1980, when the Knights of Malta asked some amateurs to give their assistance in setting up radio contacts with their field hospitals located in the territory hit by the tremendous earthquake in Irpinia, South Italy. Just following that event, 1AØKM operated for some months, until January, 1981, raising savage pileups whenever it appeared on the bands. During that period, the station made about 8,000 QSOs. The DX Advisory Committee of the ARRL, after a complete survey of the documents submitted by SMOM through the station operators, recognized the independent political status of the territory governed by the Knights of Malta and added the 1AØ prefix to the DXCC list, giving credit to the 1AØKM cards starting from its earliest operations. The amateurs who started up the station and the new country, and who at present are the exclusive operators allowed to carry out ham-radio activity there, are Al IØAMU, Tony IØIJ, Tony IØJX, Mario IØMGM, and Mario IØMXM.

Due to the room shortage in the ancient villa which houses SMOM, the 1AØKM station does not yet have a fixed setup, and the rigs, as well as the antennas, are being taken inside and assembled whenever the station must operate; this is neither practical nor fast.

A tribander beam antenna which was mounted on the building roof had to be disassembled for esthetic reasons, since the villa is recognized as an antique and a valuable monument.

At the time of this writing, the 1AØKM crew is trying to get a corner to set up a permanent shack and a permanent antenna. The already-mentioned willing boys taxed themselves and bought a Yaesu FT-901DM transceiver, a Henry R2DK Classic

amplifier, and a five band 18AVT ground plane. They plan to put the antenna on the building terrace, with provisions to tilt it down on the floor when not in operation. This stable arrangement will allow the station crew to put the 1A0 sigs on the air more frequently, possibly entering some international contests as well.

The official QSL manager is Mario I0MGM, but due to the very heavy task involved with such a management, the cards for contacts made with the other operators (I0IJ, I0JX, I0AMU, and I0MXM) may be sent directly to these boys, who will manage their own QSLs: Antonio Privitera I0IJ, Via Ceresio, 34, 00199 Rome; Antonio Vernucci I0JX, Via G. C. Abba, 8, 00141 Rome; Mario Gallavotti I0MGM, Via Cassia, 929, 00189 Rome; Alfonso Porretta I0AMU, Lgo S.Pio V, 16, 00165 Roma; and Mario Monaco I0MXM, Via R. Paolucci, 27/13, 00152 Rome.

HAM RADIO IN ITALY BEFORE WWII

It may be that the old-timers who started their activity before WWII are interested in knowing what amateur radio was like in Italy during the Fascist period. Italy had its own pioneers, like Adriano Ducati 1ACD, Giulio Salom 1MT, and others who broke the shortwave DX frontiers, establishing some world records in the roaring old times, around 1924–1925. They had government provisional permission then, as no laws or rules on amateur-radio activity had been issued in our country at that time. These laws or rules were never issued by the Fascist government, excluding one point of the Italian Postal Code where it was stated that "nobody shall exercise a transmitting radio station without the Post and Telegraph Ministry permission." Theoretically, ham radio was not forbidden, but on the other hand, the permission was not granted either. The reason for this was that the Fascists did not see with much pleasure every form of private contact between the Italian citizens and foreign democratic countries.

Naturally, radio had many fans in Italy, mostly devoted to home-brewing. There were three or four consumer magazines devoted to these fans, publishing descriptions, schematics, and advice on how to build BC radios, SW radios, and even amateur transmitters. There were also many good technicians, many of them very young, who home-brewed good SW receivers and listened to international BC stations and to foreign amateurs.

During that period, Ing. Ernesto Montu, an electronics engineer and university teacher who was famous in Italy for his *Radiotecnique Manual*, and who also had been one of the ham-radio pioneers many years before, founded the ARI, the association which still officially represents amateur radio in our country. At the same time, some amateur stations appeared on the bands in a clandestine way, with self-assigned callsigns. They did not communicate their names or QTHs, and they operated undisturbed. Their number started to grow, and in the meantime, Ing. Montu started a very small (but very dangerous in those times) QSL bureau in his own home, which also housed the ARI headquarters and a new magazine, *Radio Giornale*, the official journal of the association.

Year after year, the number of Italian hams increased. They tried to have a clean and purely technical kind of operation, in order not to raise any suspicion as to their intentions. The political police and the postal police played a very fair game and were highly tolerant as they apparently seemed to ignore that kind of activity.

I was almost a kid then and was deeply involved with radio, home-brewing receivers—at first simple crystal types, then regenerative sets with two or more tubes. When I first received shortwave, I was fascinated by the code transmissions and learned it in a hurry; then when I started to listen to the amateurs, I got really excited. I tried to get some information on how to get started, but the answers I got were vague. Some operators told me that they were Fascists, and that only Fascists could operate radio stations. Others warned me not to get involved in such a dangerous activity. I was 17 when I decided that I had to get on the air. My poor pocket (I was a student) permitted me to buy a '45 tube and an '80 rectifier, a supply transformer, and some other parts, all secondhand, and I started my activity with the 45' self-oscillating in a Hartley circuit and a Windom antenna.

I made a lot of DX contacts with that makeshift rig and got my WAC, which lived in my heart since I could not get the award from the ARRL! Although I did not declare my QTH and my name on the air, I found that some form of hidden intelligence, word after word, indication after indication, could be carried out in order to get in touch with other Italian fellows. That system worked, and I joined other friends and attended the annual meeting, a very clandestine one in Milano, where I knew Mr. Montu and had the chance to receive some QSL cards.

I had to rely only on that simple QRP rig and on a three-tube regenerative receiver, as my pocketbook did not permit much more. Many Italian hams were in possession of sophisticated transmitters, like crystal-controlled MOPAs with transmitting tubes in the power amplifier. Many of these tubes and components, like 807s and 813s, were coming into Italy through bootleggers from Switzerland. In Italy, we also had a very good commercially-produced receiver, with a six-band drum coil switching system, low-loss materials in the front end, S-meter, and optional bfo. It fit into a sumptuous mahogany cabinet like a BC receiver, but in reality, it was a real communication receiver. It was put out by IMCA, a firm owned by an underground Italian ham. That beautiful receiver was in many Italian shacks during the latter half of the thirties.

One day, I got an answer to a CQ from a very powerful station, presumably local, which gave a ham callsign and spoke perfect ham language. The operator, to my surprise, gave me an address in the same city where I lived—Bologna—and invited me to pay him a visit. His open style was very unusual in our community, but his invitation and his voice sounded so friendly that I decided to go. I turned pale when on the door I read: "Voluntary Militie for the National Security—Radio Center." I decided to turn back when a gentleman who was standing near the door asked me if I was I1PL. He said, "I imagined your surprise and your fear, so I was waiting just to reassure you, Old Man." He cordially invited me inside.

Wow! For the first time in my life I saw an RCA AR88 and an RME 69! All around were racks filled with radio gear. "Boy, what is that strange key with two black paddles? What does 'Vibroplex' mean?" I felt myself getting faint when I saw some shelves filled with *QSTs*, ARRL handbooks, and bunches of QSLs from everywhere in the world. "What kind of QSL bureau are you using?" I asked him. "Direct mail" was the answer. My surprise was endless, as there was a tight censorship of mail to and from abroad.

I visited another room where I saw several AR88s and some operators typewriting. Nobody explained to me what they were watching. My new friend was a lieutenant colonel of the Fascist Militia, a military organization composed of members of the Fascist Party which cooperated with the regular army and supported the Fascist idea within Italian society. I visited my new friend very often and introduced him to other amateurs of Bologna.

Going back in my memory to these old days, I now realize that the funny situation which had seen outlaw radio amateurs becoming friends of the people who denied licenses and transmitting permission was the mirror of Italian society in the late thirties when the Fascist dictatorship became more of a formality than a reality in everyday life, due to the humanitarian philosophy of the Italian people.

Three years later, when the tragedy of WWII was approaching and the German Army invaded Belgium and Holland, the European radio amateurs were silent, since the administrations had revoked their licenses. Italian hams were still operating, mainly with hams on other continents. One evening, the postal police, together with the political police, paid a visit to Italian ham shacks all over the Italian territory. I must say that they "paid a visit," since when they came to my home they showed extremely good manners. They had a perquisition order, but they asked kindly for permission to take a look at my shack. I was alone at home, as my mother was out, and tried to deny them entrance. They reassured me that there was nothing to worry about, but that they had to confiscate the I1PL station. They took away the rig, the key, the log, and the QSLs. My mother, when she came back, found me sitting on the outdoor step with tears in my eyes.

I ran to my friend the morning after. "Don't worry," he said. "Let the waters settle for a few days and you will have your rig back, but you have to promise that you and your friends will disassemble everything. There will be no more ham radio." A few days later, I was invited to the office of the political police, where I learned that we had been monitored for a very long time. They said that since I carried out only experimental work, I had to pay only the minimum amount of a fine, due to the infringement of the Postal Code: "Nobody shall exercise a transmitting radio station without . . .", etc. A few days later, I got my gear back and disassembled everything.

That was amateur radio before WWII in Italy.

LIMITED ACTIVITY ON 3.5 MHZ

At present and in the near future, until the Italian administration makes up its mind on issuing new rules, it will be practically impossible to work Italian stations on the usual CW, RTTY, and SSB DX subbands recommended by the IARU.

The story starts long ago in 1968 when the last Italian law ruling radio-amateur activity was issued. On that occasion, the Italian administration gave a singular interpretation to the concept of "sharing" the 3.5-MHz band between the Radioamateur Service and other fixed and mobile services. Since amateurs had a secondary status according to WARC statements at that time, they obtained in Italy only the following thin frequency slices: 3.613–3.627 and 3.647–3.667. The rest of the band was assigned to the other services.

Many years passed during which that limiting rule was slowly forgotten. During this long period, amateurs spread out from their narrow subbands and joined their foreign fellows on the whole band. After some years, Italian hams believed that the administration had issued new rules. The administration itself did not care much about this illegal operation, and that reinforced the conviction that everything was OK. I, like many others, never suspected that anything was wrong. In many instances, the ARI official magazine, *Radio Rivista*, published the amateur band plan for Italy, with the whole 3.5-MHz band assigned to amateurs according to the WARC frequency allocations, forgetting the principle that our administration had the right to forbid some frequencies to some services.

Suddenly, last spring, somebody inside these offices remembered the law. A tight monitoring started, and amateurs found outside legal subbands were warned, and some were fined. At the same time, another offensive started: Administration officers visited many ham shacks and fined all those who were found in possession of linear amplifiers, as the maximum legal power in Italy is 300 Watts input. Other minor discrepancies, like inaccurate logging, were verified and prosecuted, and some action was taken against amateurs working 144 MHz mobile from their cars. In fact, in Italy, any amateur mobile operation is forbidden, except for CBers who are authorized to carry radios in their cars.

From this perspective, other clouds could appear on the Italian amateur's horizon. The above-mentioned law does not take into consideration any unattended station outside the legal residence of the licensee: For that, all the VHF and UHF repeaters must be considered illegal and could be dismantled by administration officers. The same thing could be said about the SSB transmission mode: The old 1968 law authorizes only CW, AM, RTTY, and FM above 144 MHz; no further official act authorizing SSB has come since then.

Until today, our administration has closed both eyes; she could suddenly wake up, like she did about the 3.5-MHz band. We strongly hope that these archaic and out-of-date rules may be modified as soon as possible. But as a matter of fact, at present, Italian hams are at least out of the game as far as any 5-band activity is concerned, like contests, awards, etc.

Italian amateurs are still in shock after the withdrawal of the 3.5-MHz band. There are big discussions on the air and in the clubs. The ARI—Associazione Radioamatori Italiani—is accused of not having supported in due time the cause of Italian amateurs on that occasion. In fact, the ARI was absent when the Italian administration started its battle against amateurs. In addition, the ARI failed to warn amateurs about what was happening, so many of them continued to operate outside the permitted slices and were monitored and punished.

Italy is a very beautiful country. It is also a very contradictory one, due to its very young democracy and the problems raised by very fast growth. On one side, there is probably an excess of freedom due to a widely acclaimed liberalism—a clear reaction to the Fascist period. On the other side, most of the bureaucracy suffers from an old-fashioned paternalism to which they abdicate when in the counterpart they find power.

In the telecommunications field, the excess of freedom, unchained by a sentence of the Constitutional Court ("Everybody has the right, by any means, to express his thought"), led to an uncontrolled and abnormal growth of private TV and FM BC stations, operating unlicensed and unpermitted, with no technical control—a real jungle of interference with spurious radiation jamming other services, mainly the

aeronautical ones. The whole situation is absolutely inexpugnable due to the amount of political and commercial interests lying under it. The administration is also faced by other big problems, like the continuous increase of pirate stations. These stations work with amateur transceivers, often using linears and beams, and have invaded many frequencies allocated to the aeronautical mobile services, like 45 meters and segments of bands near 80 meters. An inestimable number of hand-held transceivers (which in Italy are sold with the same ease as a cigarette box) carry illegal private VHF and UHF communications. Due to the power underlying the TV and BC stations and the practical impossibility of locating thousands of illegal stations, the administration had to raise its hands. On the other hand, the administration, incapable of controlling the described mess and overloaded by the problems caused by the fast growth of the communications systems in our country, has a fair chance at repressing the amateurs who pose them further problems, since they are a weak and not a politically supported community.

At present, many Italian groups understand that their problems cannot be solved through traditional negotiation with the administration. They need a different platform. Maybe in the near future they will look for the support of the national media: TV, newspapers, and magazines. It may happen also that they decide to ask for support from fellow amateurs around the world and from ham magazines and foreign ham associations. We regret to inform the hams who read "73 International" around the world that, for the moment, Italian amateurs are cut out from the international path on the 3.5-MHz band and must disappear from the friendly competitions based on five-band communications. We do hope to be back with you very soon.

de MXXR

SENATOR COSSIGA

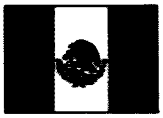
At the end of last July, a telegram was received at the editorial office of the Italian League. The telegram was sent from the Senate—more specifically, from the secretary of the president of the Senate. The telegram said that the president required another copy of the July issue of the national radio magazine, since his copy was probably lost in the mail. It was with great pleasure that a second copy was sent to Francesco Cossiga I0FCG, president of the Senate, the second highest dignitary of the state.

I0FCG has been active since 1973 but hasn't had too much time to devote to radio, and in particular, to DXing—his favorite aspect of the hobby. He has been helped by the DXers of the Rome area with info and QSL routes. During a recent interview with one weekly magazine, he said: "I am a radio amateur and I am sorry not to have too much time to dedicate to it. In any case, during the weekends and holidays that I spend in Sardinia where I come from, I like to chat with friends and contact Alaska, the USA, and New Zealand." Senator Cossiga was born 55 years ago, and after a few years of teaching at Sassari University, he joined the Christian Democrats and won a seat in the House of Parliament in 1958. He has served in various positions in the government and has also been Prime Minister.

NEW DX RECORDS

New records from I0SYN were established during July. A DXpedition sponsored by the Italian DX Blue Team took place during the end of June and the beginning of July. The trip started on June 29 from Perugia, in the center of Italy. The destination was the north of Africa. The group consisted of three Italians: I0SNY, I0KBL, and I0RSC, plus EA5RK. Ceuta, EA9, was reached by car on July 2 after a trip of 3000 kilometers. On July 5, the first record was made with a contact on 1296 MHz with I8TUS/8, for a distance of 1914 kilometers. After giving new ones on 144 and 432 to all Europe, the group started working on 10 GHz, and on July 8, several contacts of more than 1500 kilometers were made. The record contact was 1683 kilometers, with I0YLI/IE9. Next year the group will try again to activate other countries on various frequencies and to break some records.

de I2MOP



MEXICO

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OPERATING IN MEXICO

I have received quite a few letters from foreign colleagues with regards to operating within Mexico while on vacation. No doubt the following information will be useful to many who may have wondered this as well.

Can You Operate In Mexico?

Sure you can! However, just as in all lands, papers are required. And where there are papers, paperwork is involved. Mexico is not the exception. Some call it "red tape." It all depends on how you look at it. This brings to mind an expression that my mother often helped me to appreciate: "What's worth getting is worth waiting for!" It has come in handy and helped me keep a proper perspective of things in life.

What Do You Need To Do?

Well, there are different factors involved. First of all, this depends on whether your country and Mexico have a bilateral or reciprocal agreement or not. The United States does *not*. But if your country does, then you can write to Mexico for an application at the following address: Secretaria de Communicaciones y Transportes, Subdireccion de Operacion de Sistemas Radioelectricos, Depto. de Normas y Reglamentos, Mexico 12, D.F.

The application will state what present requirements are in your case. This, of course, all depends on what details are covered in the reciprocal agreement between your country and Mexico. A photocopy of your present ham license will definitely be asked for upon submitting your application. All foreign visitors will be given a license not exceeding one year from the date it was issued and not longer than the expiration date on your visa. If your home license expires even earlier, don't expect to receive a permit to operate in Mexico for a longer term than what you were issued in your homeland.

No Reciprocal Agreement, You Say?

There still exists the possibility of your getting a limited ham license here, so don't fret. The Mexican FCC (Secretaria de Communicaciones y Transportes—SCT) will establish the requirements that should be satisfied in addition to those requirements that are already set for national amateurs-to-be. The tourist receives a visa for no more than six months, so his license could not be issued for more than that amount of time. The immigrant has to renew his visa (FM-2) each year for five years, so he can be issued a renewed license each year upon presenting a photocopy of his renewed immigration papers.

In either case, if your country does not have a reciprocal agreement with Mexico, then three tests are to be taken.

1) *Morse code*. If you apply for a first-class license, you will be tested at 13 words per minute, second-class applicants will be tested at 10 words per minute, and the beginners will be tested at 5 words per minute. The restricted license (good for one year and not renewable) does not require the code test.

2) *Theory*. This includes electricity, magnetism, and radio communication. Yes, you guessed it! All in Spanish and in your own words! What better incentive could you have for brushing up on your Spanish, besides coming to Mexico?!

3) *Regulations*. You could compare this to a written driver's test. You'll have to know the laws and regulations of the airwaves here in Mexico, just as in any country.

Whether your country has a reciprocal agreement with Mexico or not, you will be required to send in with your application a letter of responsibility, where a national amateur (one who has the same or higher grade license than what you are applying for) states that he will become responsible for you. Many of our *73* readers have already established long-term friendships with different experienced Mexican amateurs over the years and perhaps even had an "eyeball" or two together. So that should not present a problem for you.

Study Matarial for the Mexican Ticket?

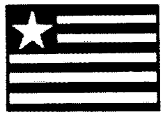
Why don't you write to Pablo A. Mooser M. XE1SR, Av. Schiller #329, Mexico 5, D.F., and get his book: *Guia de Estudios para la Licencia de Radioaficionado* (*Study Guide for the Ham Radio Amateur License*) in Spanish and study up right away! He can also recommend to you some other real fine publications available in Spanish as well, being President of the Amateur Radio League here in Mexico.

Which Class License Do You Want?

Well, then again, that only depends on your personal skills and know-how. Class I and Class II are similar (the only difference being that you can transmit with 1 kW with the Class I license in certain areas and with 250 Watts with the Class II license in certain areas. This is all explained in detail in the above-recommended book and in Mexico's official regulations.

After applying for your license, the Mexican government will then advise you where you should go to take your tests; a few months will be given as a margin. So it would be best for you to apply as far in advance as possible for these tests if your country has no bilateral agreement with Mexico.

Since Mexico borders with the United States, I know that many amateurs from the US visit this country frequently and some may have assumed that there is no way to operate here in Mexico. Nevertheless, my idea here has been to help you realize that you *can* operate as a legal amateur here in Mexico upon fulfilling the proper requirements, even though there is no reciprocal agreement between the US and Mexico. A Mexican amateur cannot get his US license either, unless he fulfills requirements asked by the FCC. And when you think of it, isn't this part of amateur radio? Don't forget that "what's worth getting is worth waiting for!" And thanks again for your many fine letters!



LIBERIA

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Did you ever hear of a *fixed-frequency* amateur net?

Anything can happen in Liberia! We are setting up a fixed-frequency net in the forty-meter band at 7.060 MHz. It is not limited to fixed-frequency radios and it is not limited to stations in Liberia. Actually, the net is in operation at the present time and OX stations, with or without traffic, are welcome to check in. It meets every Sunday morning at zero eight hundred zulu and on other days at zero seven hundred zulu.

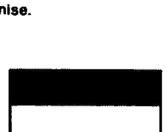
Then why all this talk about the fixed frequency?

Well, the Liberia Radio Amateur Association is receiving some two dozen fixed-frequency radios. They are Heathkits and will be converted and crystalled for 7.060 MHz. They will remain Association property and will be rented out for five dollars a year (or less if necessary).

Our Novice-class operators are permitted phone at 7.060 MHz so that they can participate in the net activities. This is important for their encouragement and at the same time it makes our net communication system more effective. This is a very important factor for us here in Liberia where phones and postal service either do not exist or are not dependable. Novices (and in some cases, Generals) cannot afford to buy amateur-radio equipment, so these fixed-frequency radios are going to fill a real need.

The 7.060-MHz frequency is a kind of "get-together frequency" for Liberia and the countries within hearing distance, so our young operators should have ample opportunity to "get out." At the same time, they can talk to each other and they can practice code, on the air, communicating with each other by code. We are excited about this little venture.

The fixed-frequency net is not needed in many other countries, but for us it holds real promise.



THE NETHERLANDS

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RADIO-AMATEUR EXAMS

Twice a year, spring and fall, the Dutch amateur-radio exams are held. All persons who want to get a D license (145 MHz, no code) or upgrade to C class (145 and higher, no code) have to pass this exam.

The exam for the Dutch novice D li-

cense consists of 40 multiple-choice questions about transmitters, receivers, antennas, filters, radio regulations, and license conditions. Three answers are given for each question; you must have at least 29 correct answers to pass this exam with good results.

For the C license, you have to fill in 50 questions and you have the choice of four answers to each question, but you must have 35 answers correct to get a C license.

For the D exam, you have 75 minutes to complete all the questions. For the C exam, you have 30 minutes more time to finish.

The exam is held in a large hall normally used as an exhibition hall. Hundreds of tables and chairs are placed in this enormous hall, with space enough between each table so that it is impossible to look at your neighbor's exam papers.

The exam questions are bundled in a small 15-page booklet. The answers to the questions must be written down on a computer form, so that the forms can be calculated by a computer.

The Dutch amateur-radio exams are not free. The cost is 50 Dutch guilders and must be paid in advance to the account of the Dutch PTT.

After passing the C exam, you can upgrade to the A status (all bands, all modes). For this A status, you must pass a code exam of 12 words a minute.

The results of the exams are mailed to each person who takes the exam. It takes three weeks before the results are mailed. In the meantime, however, there is another way to know the results.

After the exams, National Dutch Amateur Radio Station PAØAA has a special broadcast about the exam results. The Dutch television also publishes the results on the "Dutch Teletekst System."

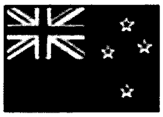
In 1982, a total of 1607 candidates came to the D exam. 2429 persons took the C exam. So it is plain to see that the interest in amateur radio is very much alive in Holland. Most of this interest is due to the code-free exam of the C and D licenses, but most of the amateurs try to master the code after some years working on VHF and UHF.

If you pass a Dutch amateur-radio exam with good results, you have to sign a paper, a kind of contract, which states that you agree with the license conditions and that you'll agree with rules to be taken by the authorities in the future. So you are agreeing with rules that you do not even know. Well, isn't that a bit strange?

On the day of the exam, the Dutch Radio Control Service has a very busy job. The reason for this is that some amateurs take their radio receivers with them into the exam building so they can receive the answers to all the questions. You can't believe it, but it is the truth. I'll tell you how this works out.

A person enters the exam room, takes his exam as quickly as possible, then goes away and walks to a parked car or a hotel room. In this car or hotel room, his friends are waiting for him and they sort out in no time the correct answers to the questions. They do this with the help of some smart guys and a couple of books. Now they transmit all the answers by radio into the exam room, where their friends are waiting with their receivers. Although the check-in at the exam room is very aharp, some manage to bring their receivers along.

You can imagine that the Dutch Radio Control Service does a lot of radio direction-finding at the exam. When I heard this story for the first time, I thought it was a joke! However, last year I heard it with my own ears on the FM band of my car radio.



NEW ZEALAND

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Napier
New Zealand

ZL PREFIX CHANGES

NZART made proposals to the regulatory body, the New Zealand Post Office, that separate prefixes should be allocated to the Chatham Islands, the Kermadecs, and the Auckland/Campbell Islands instead of the present /C, etc., method of identification.

The proposals were adopted, and from January 1, 1984, the ZLØ-9 series will be used as follows: ZLØ—for visitors to New Zealand (no change); ZL1-4—for mainland New Zealand, i.e., North Island, South Island, and Stewart Island (no change); ZL5—Antarctica (no change); ZL6—New Zealand Intruder Watch (no change); ZL7—Chatham Islands; ZL8—Kermadecs; ZL9—Auckland/Campbell Islands.

The ZK series will be as follows: ZK1—Cook Islands (no change); ZK2—Niue (no change); ZK3—Tokelau Islands (previously ZM7); ZKØ, ZK4-9—reserved.

The ZMØ-9 series will continue to be held in reserve and used on special occasions at the discretion of the Post Office. So, prefix hunters and all other interested amateurs, as of January 1, 1984, there will be a few more prefixes available by working the New Zealand off-shore islands under their new callsigns.

THE AREC STORY CONTINUED

AREC in ZL today consists of about 75 Sections and between 800 and 900 active members. Because there are more AREC Sections in Auckland and Wellington regions than there are callsigns in the ZL1E and ZL2E series, the New Zealand Post Office has approved the use of ZL6E calls in the Auckland region and ZL7E calls in the Wellington region. So when you hear such calls as ZL6EBA and ZL7ECA, they are not a pirate station or some rare DX, but Amateur Radio Emergency Corps stations in the Auckland and Wellington regional areas operating emergency communications networks. Who knows what the next 50 years will bring? A massive increase in the South Island population could mean ZL8E and ZL9E callsigns for AREC.

Two features of AREC in ZL are unique. Both stem from the Post Office recognition of the Radio Emergency Corps from its inception.

The first unique feature is the distinctive callsign series allocated for AREC stations in which the first letter of each callsign following the prefix is always an "E". The special "E" callsigns identify stations engaged in emergency communications and warn other amateurs not to interfere with what may be urgent or vital traffic. No other country has the advantage of such a system.

The other feature is the allocation of spot frequencies within or on the edge of the amateur bands specifically for AREC use. These are 3500 kHz, 3900 kHz, 7100 kHz, and the exclusive band of 1900-1925 kHz. Other frequencies may also be used for AREC communications when and as required.

In the early days of AREC, all equipment was home-built and performance varied considerably depending upon the skill of the constructor and the skill of the operator. Initially, all operation was on CW. All operators were amateurs who, when involved in field searches, had to be fit enough to travel with the search parties and carry the extra weight of their radio equipment, too!

The postwar years saw the adaption of war-surplus equipment for AREC use. Subsequently, special radio equipment was developed and produced for AREC use, initially AM and CW, and in the last few years, SSB, the present AREC sets for field work being TR 105s, while most base stations and field-search HQ stations are modern-day transceivers suitable for operation from emergency power supplies.

The advent of modern amateur equipment has revolutionized AREC operations, operators now being able to use complex equipment that was not dreamed of in years gone by. Just as HF equipment had become plentiful for amateurs, the migration of VHF amateurs to the 2-meter FM band and the establishment of repeaters has revolutionized mobile and portable operation.

The facilities for purely local communications are excellent, and because most VHF equipment is easily portable, its suitability for emergency and Civil Defense applications is obvious. With VHF links between the search teams and field-search HQ, now the amateurs do not have to carry heavy equipment, but just a light hand-held with an additional battery supply, and they are good for several hours of search and rescue work.

Two organizations have been established and developed along with AREC since 1948. The first of these, the Search and Rescue Organization, is sponsored primarily by the Civil Aviation Division of the Ministry of Transport and the Police Department. Any search for missing persons or for missing aircraft comes under the control of one or the other of these government departments, and AREC has the continuing role in the provision of communications to and from the field and frequently in the field as well. AREC is financed by an annual grant from the Search and Rescue Organization.

AREC also has a role in the Civil Defense Communications Network, providing the communication between Civil Defense Headquarters and the Sector Posts in most Civil Defense areas.

The present Officer Commanding of the ZL AREC, Ron Morgan ZL2GQ/ZL2EX, is quoted here to conclude this resume of the emergency amateur service as it exists in New Zealand:

"As the latest in the line of OCs of AREC, I am aware of the work, the planning, and the efforts that have been put into the development of the AREC of today by my predecessors and conscious of the need to continue to make every effort to preserve the good repute in which the Corps is held. To me, amateur radio is the greatest hobby in the world. AREC is the aspect of amateur radio that can be of service to the community, and in return for the privilege of enjoying the hobby, I believe that I, and every other ZL radio amateur, too, owes support to the Corps."

AWARDS

Remember the Hastings Centennial Award, 0001 hours GMT, February 1, 1984, until 2400 hours GMT, February 29, 1984. All bands, all modes; see last month's column for details of contacts required.

BITS 'N' PIECES

Recently, another World Communications Year activity took place at the Hawkes Bay Royal Show (County Fair) when the Napier and Hastings Branches of NZART combined to display amateur radio to the public. During the three days of the Royal Show, the combined Branches were allocated the special callsign of ZL9WCY and operated amateur stations from the display stand at the show. Also, they had static displays of AREC equipment, old and present day, some vintage radio equipment, and present-day transceivers.

There were three working amateur stations, one on 20/15/10 meters, one on 40 meters, and the other on 2 meters for local communications. Propagation was not good for the HF bands, but some excellent QSOs were made with US amateurs and others that helped to demonstrate amateur radio to the public.

There was a third section to the display where the public could touch special display items such as a vintage receiver tuned to the local broadcast station, with the output fed into a scope showing the patterns of the carrier and the sound/speech. These "touch" display items proved very popular with young and old alike.

In an earlier column, when I described the national organization of amateur radio in ZL, it has been pointed out to me that I failed to indicate clearly the method by which our president is chosen.

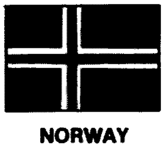
NZART is probably one of the few national radio organizations where the members elect the president every two years. For the biennial elections, nominations are called for all offices, including that of the president, so here in ZL the members of NZART elect their president, unlike other national organizations which appoint from one of the elected council or executive.

February is the month when all NZART Branches are making feverish preparations for the National Field Day Contest. This year, so I'm told, there will be a special YL team operating one of the non-active Branches somewhere in the North Island.

Good luck to the YL team; the extra multiplier and contact points will be appreciated by all National Field Day participant teams.

More 50-year certificates to members of the ZL Old-Timers Club have been issued. Congratulations to the following: M. D. Mason ZL1NW, Tauranga; S. C. Baveystock ZL1NX, Tauranga; Watty Briden ZL1PN, Auckland; George Anderson ZL2JG, Waikanae; Jack Moore ZL2JM, Fielding.

Dates to remember: June 1-4, 1984—the NZART Rose City Conference at Palmerston North. If you are planning a trip to ZL about that time, you will be most welcome at our annual convention. Enquiries to the Rose City Conference, PO Box 1718, Palmerston North, New Zealand, or to me at my home QTH.



NORWAY

Bjorn-Hugo Ark LA5YJ
N-3120 Andebu
Norway

Since my last column there have been some interesting activities in Norway. Of special interest was the yearly national convention of NRRL, held in Bodo, in northern Norway. This year's elections seemed both to underline the differences between the HQ members and the ordinary member and to smooth them out. I guess that's what democracy is all about, is it not?

Mr. Odd Andersen from the Norwegian Telecommunication Direktorat in Oslo gave a speech on the new license regulations expected to be issued. Word about a promised A license of 600 Watts output was very popular information for the nearly 100 members gathered—representing about a third of the total voting membership.

At a DX session earlier that morning, Alf Almedal LA5QK announced that they are at work getting Peter I Island recognized as a new DXCC country (which by now may already have been confirmed). He also said that a Norwegian Antarctic expedition will take place in late 1984, and that they were working to see that some of the members of that expedition will be ham operators. Rangnar Scholberg LA7FD and Mathias Bjerrang LA5NM, well-known operators from JX- and JW-land, held an interesting session about operation from the Arctic.

The convention was an absolute success, and the two local sections of NRRL, the Bodo and Fauske groups, could not have been praised more for their excellent planning and the smooth-running sessions.

Odd Andersen speaks at the NRRL convention.

DX CONVENTION

At the annual DX convention in Oslo, most of the eastern Norway members of the LADX group were gathered to elect a new president and members of the board. An unfortunate accident to Stig Lindblom LA7JO a week before kept members from central Norway away from the convention and kept the mood of the meeting rather low. Happily, LA7JO survived the fall from his 16-meter (48-foot) tower. He fell head first, and it is a mystery how he was able to survive without any greater harm than broken and crushed arms, although his condition was very serious for the first couple of days.

Svein Ovenstad LA3XI was elected as the new president of the LADX group. His predecessor was the late LA1KI, and the presidential chair had been empty for nearly a year since no one really wanted to touch the memory of our highly respected and beloved friend LA1KI, Norway's well-known top DXer for many years. The members of the board ran the LADX group in the meantime and did a good job.

Kare LA2GV was presented the trophy for being the top-score Norwegian operator in the SAC contest, 1982, in the single-operator/allband class. LA2GV had won the same trophy before, and I had the great pleasure of receiving the trophy on his behalf.

The LADX group is now looking into how to get SM0AGD to come over and talk about his DXpeditions to our members; it also is involved with a couple of rather interesting projects which the board seems to be keeping secret!

MALPELO DXPEDITION

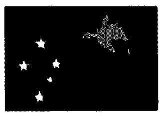
Hurray, Colombia! You did it! HK0TU (Malpelo) went on the air. The whole world was waiting, and *you* gave it to us. And congratulations for an excellent operation, which must have been very thoroughly prepared, with a touch of the good old days in it: not a foul word, no irritation over the often-too-eager operators trying to work them. This operation was something all the members of that crew could be proud of.

We here in Europe too well remember a certain PY0 operation not too long ago which will go into legend as one of the poorest SSB operations from a rare place in years. But a German group put that all right again. That group actually always does a good job, so anything else from that side would have been a shock. The Colombians did their effort to straighten this out in a tremendous manner. Thanks again, guys; good work.

DXers, well, it's time to look for Europe on the lower bands again.

40 has as always been very good, but when you are reading this, 80 and 160 will be at their peak to many areas. Remember, keep clear of the DX windows. You never know, day or night, when the bands will open. Most of the day and night there will be openings from Scandinavia both on 40 and 80 meters, toward North America and Japan. Listen in if you're interested in some good DX QSOs.

New countries we all are waiting for include Kermadec, Clipperton, China, Bouvet, Peter I Island, and San Felix. When will they come? Kermadec is due, China has been worked by many, but the rest? We'll wait and see, won't we? The thrill of a new one is always there, and the pleasure after working it, as well. Hours of strained listening, intensive calling, and then the feeling of your heart doing a couple of extra beats when your call is returned. And then the nervous tremble in your voice when confirming and giving your report, that's what it's all about! Thanks to the guys giving us that pleasure of working them.



PAPUA NEW GUINEA

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Rabaul
Papua New Guinea

This will be my last contribution from Papua New Guinea. In fact, as I write this, the station has already been dismantled and the antennas have been taken down. All the ham gear is packed and en route to VK. P29NSF went QRT on October 3, 1983, and will reemerge as VK4VSF from Brisbane.

We have spent 22 years in Papua New Guinea and been witness to great changes in the country. We have seen the peaceful transgression from Australian administration to self-government to independence in 1975. We have seen a people emerge from the Stone Age into the 20th century. I have been a P2 amateur for 3½ years and enjoyed it immensely. An excellent location, good equipment, and a husband ready to indulge every whim connected with amateur radio made it a pleasure to operate. It has been fun being a DX station; being at the receiving end of pileups gives you a good feeling and it is very good experience. However, at times I have had to go QRT because some operators have no discipline or manners.

On September 20, 1983, at 0153 GMT, I worked VK4MAL aeronautical mobile, operator Barry, on 15m en route to Biak in West Irian, thence Manila and Hong Kong. There is quite a story attached to this one.

The aircraft, a 41-year-old DC3, saw service with the US Army during World War II and was bought by a retired pilot who flew it to Hong Kong for Cathay Pacific. It became that airline's first aircraft and flew the Hong Kong-to-Sydney run carrying passengers and mail.

In 1963, the old girl was sold to Mandated Territory Airline (MAL, hence the callsign) and flew in Papua New Guinea for 10 years. When Ansett Airlines of Papua New Guinea bought out MAL, the DC3 went to bush pilots of Queensland. The DC3 played a major role for bush pilots for another 10 years.

Now Cathay Pacific has bought the old bird back to display her in their museum in Hong Kong. A fitting retirement! The aircraft made a nostalgic flight into Port Moresby on September 19 under its original Cathay registration, VR-HDB, on one side and the Mandated Territory registration, VH-MAL, on the other side. The aircraft is painted in original Cathay Pacific colors.

After refueling in Port Moresby, the DC3 flew to Wewak and made an overnight stop there. I worked the station VK4MAL aeronautical mobile en route Wewak to Biak and consider myself privileged to have had the contact.

The aircraft was due in Hong Kong in time for the 37th anniversary of Cathay Pacific on September 23. Every "Territorian" has a soft spot for DC3 aircraft, as they gave wonderful service to the traveling public in this country in the past. Many a time have we flown "side-saddle" in a DC3! Nowadays Boeing 707s and F28s are used by Air Niugine, but several

The author has the pleasure of presenting a trophy to Kare LA2GV. He was the top-score Norwegian operator in the SAC contest in 1982.

Jorgen LA5UF and Svein LA3XI were represented among the top ten DXers in Norway.

DC3s are still with the Papua New Guinea Defense Force.

What news from the P2 amateur scene? A new arrival is Bob P29PR, ex-VS5RP and -G3REP. Bob has just joined the Post and Telecommunication Corporation in Port Moresby. He has a Kenwood TS-180 and is active mainly on CW on all bands. Bob hopes to put P2 back on the CW map! His favorite band is 1.8 MHz, but he has found the noise level extremely high. Bob reports reasonable success on 80m, but as yet has not managed to get into W-land on that band.

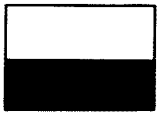
No doubt the ranks of amateurs will be swelled in Papua New Guinea as the OK Tedi Mine becomes fully operational in the Western Province. Already on the air from Tabubil are John P29NJS and Stan P29SO.

The Papuan Motor Sports Club in Port Moresby held its annual Independence Weekend Car Rally starting at 6 pm on September 14 and ending at 9 am on September 18. Throughout the event, communications were maintained by members of the Papua New Guinea Amateur Radio Society. The communications aspect was an unqualified success with stations working through the Moresby repeater and simplex, and as the rally moved further away from Port Moresby, on 40m during the day and on 80m at night.

Twenty-seven teams participated in the rally, amongst them six entries from Australia. Operating from O car was Peter P29NUK/ZUK, maintaining contact; the director of events, Wayne P29ZWW, upheld communications from another vehicle; the vehicle setting up control was manned by Bob P29BS. Finally, and bringing up the rear in the sweep vehicle, a sturdy 4WD to ensure that all cars had managed to get through safely, was Paul P29NPL. Manned relay stations were in operation, as well as field stations, and Rick P29ZFS was working as a manned 2m repeater. The complete success of the Independence Weekend Car Rally has convinced organizers to hold similar events throughout the year and Peter P29NUK intends to participate as navigator in the next one. Good work by the PNGARS!

The weekend of October 15-16 saw activity for the Jamboree of the Air and the Governor General of Papua New Guinea opened the event on P29JOA. Widespread interest was created, not only amongst guides and scouts, but also among police cadets with a view to forming a police radio club.

So much from me and from Papua New Guinea and my best wishes to everyone.



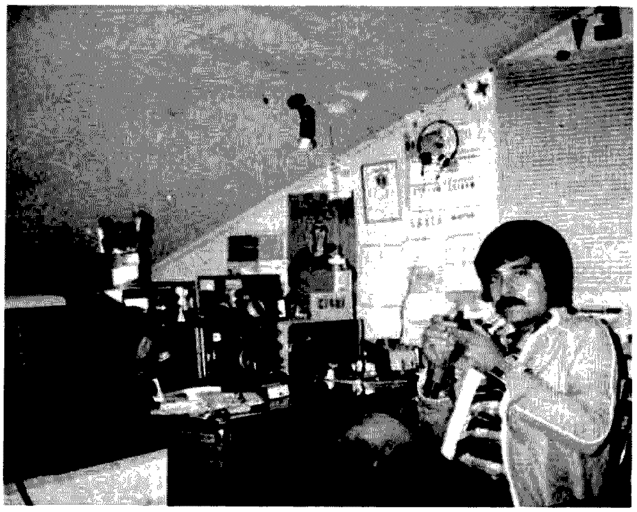
POLAND

Jerry Scymczak
78-200 Bialogard
Buczka 2/3
Poland

RADIO-LOCATION CONTEST

Amateur radio-location contests in Poland are becoming more and more popular. The Radio-Location Contest is organized in two bands, 3.5 MHz and 144 MHz. Competitions in each band are separate. Every entrant for the competition can compete in both bands or in only one of them. All participants of the contest are divided into the following categories:

(a) women irrespective of age;
(b) teenagers (boys and girls under 15 on January 1st of the year of the contest);



CT4UE in his shack.

(c) juniors under 18;
(d) men more than 18;
(e) seniors over 40.

Women, juniors, and men are appraised as a collective and as a team. The teams taking part in the top competition—the championship of Poland—represent provinces. The number of partakers from any province is to be limited to three in all categories. Individual contestants can take part in other competitions.

Every participant in the contest brings a radio receiver with antennas of one's own, a magnetic compass or the other one, a wristwatch, and a medical certificate of one's health. The use of a radio receiver with noises detectable at a distance of 10 meters is forbidden.

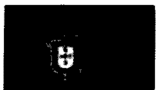
The organizer of the contest provides every participant with a map of the contest terrain. The terrain of the contest is to be predominantly arboreous and differences in its levels cannot be greater than 200 meters.

Five radio transmitters are to be placed at distances not less than 750 meters from each other. The overall length from the start through transmitter number 5 is to be 4-6 kilometers measured on the map. The transmitters are to be hidden so as not to be seen at a distance of 3 to 5 meters. The transmitters must not be placed in buildings or impenetrable places.

In each band, work the 5 transmitters successively: first minute—transmitter number 1, second minute—transmitter number 2..., fifth minute—transmitter number 5, sixth minute—transmitter number 1, and so on.

The emission A1 (telegraphy without modulation) is used in the 3.5-MHz band and A2 (telegraphy with modulation) is used in the 144-MHz band. Recommended keying rate is 30-45 marks/minute. All the transmitters are to operate best at the same frequency: 3500-3600 kHz in the 3.5-MHz band, and 144.500-144.845 kHz in the 144-MHz band. The power output of transmitters is to be 3-5 W and the stability of frequency not worse than 0.05%.

After a start signal one minute before the keying of the first transmitter, competitors in five-man groups run along alleyways 50-250 meters in length. When they are at the ends, their radio receivers are switched on and they begin to look for the transmitters. The sequence of detection is optional; however, transmitter number 5 must be found obligatorily and as the last. Transmitter number 5 ends its keying when all the competitors reach their goal. The time of the race and the number of detected transmitters determine one's place in the contest.



PORTUGAL

Luiz Miguel de Sousa CT4UE
PO Box 32
S. Joao do Estoril
2765 Portugal

It is with great pleasure and personal satisfaction that I write this first column for *73*. I will emphasize some aspects of the oldest association of radio amateurs we have in Portugal, known as REP—Rede dos Emissores Portugueses.

REP was first founded in December of 1926 by Mr. D. Eugenio de Avilez, formerly CT1AE, and other enthusiasts. It now has approximately 1900 members, more than 50% of the Portuguese hams. In 1980, it was recognized as a public utility by the government.

According to REP's constitution, we have elections every two years to elect our Board of Directors, and an Annual General Meeting is held to present and approve reports of the past year, including the accounts.

Being a member of IARU, REP offers a lot of services to its members. These are a few of them: reception and shipment of QSL cards from and to other bureaus, handling the paperwork required for examinations and new licenses, renewal of fixed, mobile, or portable licenses, supply of technical books, and publication of the REP magazine or an informative sheet every three months. In either of these two publications, members have the latest news about DX, electronics, awards, telecommunications via satellite, and other important matters.

Every year, we celebrate our anniversary and have a regional contest on VHF and HF with all the Portugese regions (CT1/4, CT2, CT3).

On Mondays at 2230 local time, a radio bulletin is transmitted by CT1REP through the repeaters and also on 80-meter phone. In addition to this, REP gives assistance to all foreign hams who wish to operate from this country. For those interested, we only need a letter requesting this service.

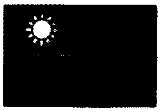
Owing to the existence of reciprocal agreements with some countries, it is very easy to operate from Portugal. At this time, we have reciprocity with the following countries: West Germany, Austria, Belgium, Denmark, Holland, Switzerland, Sweden, United States of America, England, Canada, Morocco, Brazil, Venezuela, South Africa, and Bolivia. More details about this will be given in the future.

The station that we have in REP is composed of a Yaesu transceiver (FT-902 DM), an FC-902 antenna coupler, an SP-901 external speaker, and an FV-901 DM, all this offered by Yaesu Musen in Japan. We also work on VHF using a Kenwood transceiver.

On the air, mostly around the DX frequencies, we might hear Portuguese hams using several modes of transmission—SSB, CW, SSTV, and RTTY. Some of them (very few) are also active through the satellites for ham use. It may be of interest to you to know that we have 15 repeaters on VHF and 2 on UHF.

We have our weekly meeting on Monday at 2100 local time. If you are in Lisbon, you are kindly invited to visit REP's headquarters, right in the heart of Lisbon. Last November, our good friend Frank Rose W1TIV came to see us and signed the Honour's Book.

Our address is Rua D. Pedro V, 7-4°, phone 361186. Just in case you forget the address, you may contact me at phone number 2688318 during the evenings.



TAIWAN

Tim Chen BV2A/BV2B
PO Box 30-547
Taipei, Taiwan 107
Republic of China

To direct the attention of our people to the contribution of communications toward world peace and social developments, the Directorate General of Posts, Republic of China, has released a set of two stamps for commemorating the World Communications Year. Also, Chinese Posts and Telecommunications Department has finally granted permission to a group of Italian hams allowing them to operate in Taiwan.

The DXpedition group, consisting of three members (instead of four as previously reported) of the ARI DX Blue Team (I2MQP/BV, I2BVS/BV, and I2NYN/BV) arrived in Taipei on September 18 via KLM Airlines. They were settled in a new hotel, "Long Life," close to BV2A/BV2B.

On September 19, Mr. Hu, secretary of the China Radio Association, lent hands to take delivery of two transceivers (IC-740, IC-2KL) and accessories from the customs at the CKS International Airport, 45 kilometers from Taipei City. A deposit equivalent to US $150 approximately instead of customs duty payment was placed for warranty of shipping all imported articles out of the country (ROC) within six months. As a matter of fact, all rigs after operation were duly reshipped out and the deposit money was refunded without any problem.

The imported equipment with a 2-element yagi and a vertical tribander were set up at a QTH near a public park on the roof on a 12-story building which is spacious for antenna installations and good for both receiving and transmitting purposes. The DXpedition station was dismantled on September 24, a half day earlier than the set schedule because of a strong developing and approaching typhoon.

This initial expedition activity was highly evaluated by us. Local authorities are glad to see that through amateur radio, we have

done a lot in promoting international goodwill and friendship between people of the world. Making eyeball QSOs further enhances better understanding.

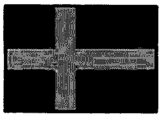
Some local important newspapers—*The United Daily*, *The China News Agency*, and *The English China News*—had good comments on the worldwide friendly movements of amateur radio. This has brought to the attention of the public the progressive quality and unique relations existing in this field.

All visitors were entertained by the China Radio Association at the Army Officers Club. They were introduced to many important officials at the party. Before their departure for home in Milan, a sight-seeing tour was arranged for them to visit the National Palace Museum, where they found great pleasure and relaxation.

I am pleased to have contacted I2MQP/BV, I2BVS/BV, and I2NYN/BV to offer them a new country credit; it also made my day to have the two way communications domestically.

I hear a group of JAs are planning to make a DXpedition to BV-land in January, 1984. I shall report in due course.

The ARI DX Blue Team in Taiwan. Left to right: I2BVS/BV, I2NYN/BV, BV2A/BV2B, and I2MQP/BV.



SWEDEN

Rune Wanda SM0COP
Frajavagen 10
S-155 00 Nykvarn
Sweden

FOX HUNTING

Eskilstuna Sandare Amatorer, Club SK5LW, hosted the 1983 Swedish Championships in Amateur Radio Direction Finding (ARDF), popularly called fox hunting.

The championship is a combination of one daytime and one nighttime hunt. Winner in this combination was Christer Eriksson followed by Gunnar Svensson, a well-known name in these circles here. Neither of them is a ham; this is a sport for anybody. Leif SM5EZM was third but winner of the day event. The total number of participants was 50, of which there were two YLs. Kurt SM5OW, at 85 years of age an old-timer in ARDF, placed 39th and is still going strong.

The "foxes" were five very-low-powered transmitters on 80-meter CW hidden in the woods. The hunters were equipped with maps, compasses, and small ARDF receivers. At night, a flashlight was needed. Some hunters said that they preferred rainy weather because then they didn't hesitate when they crossed a swamp since they were already wet!

DX MEETING IN OREBRO

Club SK4BX, Orebro Sandaramatorer, arranged the popular annual gathering of Swedish DXers. SK4BX is a very active club some 150 km west of Stockholm. The club members always participate in major contests and the QSL cards on the walls show that SK4BK is successful in the DX pileups. The club runs one repeater on VHF 145.850 MHz, and one on UHF 437.650 MHz, as well as a UHF beacon on 432.980 MHz.

In early 1982, the club moved into a fine building (restored by the members) located just outside the city of Orebro. This QTH has great antenna possibilities and the lack of immediate neighbors minimizes the risk of TVI/RFI complaints. The antenna tower is 40 meters high (130 ft.) with a TH5DX beam just under the 20-element Cue Dee yagi for 2 meters. Other antennas are for 160, 80, and 40 meters, and in the planning stage is an EME array for 70 centimeters.

Over 50 DXers got to meet in Orebro, some coming from as far away as the most southern part of SM7, an eight-hour drive by automobile. The top attraction was the talk and slide show by Erik SM6AGD, member of the DX Hall of Fame. During the last ten years, Erik has made quite a few very successful operations from the most rare spots throughout the DXworld.

Being a top-grade CW operator, he has made CW buffs as well as SSBers happy. During the last eight months of 1982, Erik toured the rare South Pacific islands and worked 47,260 contacts.

He tried to limit the number of slides to less than 300, but his interesting and witty comments during the two-hour talk made everybody wish he had brought more. The last slides showed his QSL manager, Joergen SM3CXS, plodding his way to the mailbox through five feet of Nordic December snow to pick up the daily pounds of QSL cards. Joergen has now bought a snowblower to speed up future QSLing.

The club's own DXpedition last summer to OJ0 Market Reef was shown by a professionally made film with authentic recorded sound. Goran SM4DHF, Kenneth SM4EMO, and Goran SM4HOO had to halt their operation after two days because of additional paperwork requested by the Finnish licensing authorities which luckily was resolved. During that silent period, they moved their rig and antenna a few feet east on the tiny reef and worked portable SM5! Market Reef is divided by the Finnish-Swedish national border.

SK4BX had furthermore managed to get a video recording from the Heard Island DXpedition slide show narrated by Jim VK9JKS himself.

SWEDISH HAMS DENIED SPECIAL WCY CALL

The United Nations declared 1983 as World Communications Year. In most countries, both the telecommunications authority and the radio amateurs have acknowledged the WCY by various special activities. One way of giving WCY publicity in many countries has been the issuing of special WCY callsigns. In Sweden, the league, SSA, applied for this kind of a call (suffix) to be used by club stations in each call area. However, the Swedish licensing authority, Televerket, has rejected this application.

MOTIONS TO IARU REGION 1 CONFERENCE

The International Amateur Radio Union (IARU) Region 1 Division was formed in 1950 to promote the special interests of the member societies in the International Telecommunication Union Region 1 (Europe, Africa, and parts of Asia) and to represent their interests at ITU conferences.

The Swedish amateur radio league, SSA (Sveriges Sandare Amatorer), has sent three motions to the IARU Region 1 Conference 1984. The first motion is about the Worldwide Grid-Locator System. In Europe, one system has been used for years, primarily in VHF/UHF traffic. It is extremely popular amongst VHF/UHF enthusiasts to collect locator squares in a manner similar to hunting for DXCC countries. The new worldwide locator system was accepted by Region 2 at the Cali Conference in Colombia in 1983, to be used in contests and for awards. Region 3 has also accepted this. The motion from SSA suggests an acceptance by Region 1 and implementation on January 1, 1985. Basically, the world surface is divided into fields by 18 lines longitude and 18 lines latitude. These fields are divided into squares that are 2 degrees longitude and 1 degree latitude, which will give very good accuracy in determining QTH position.

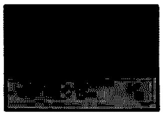
The second motion concerns the timing system for EME traffic which is different on 144 MHz than on 432 and 1296 MHz. The SSA wants the IARU to recommend uniformity as well as a timing system with one-minute sequences.

The third motion: Because of the collision between the satellite traffic and the Region 1 VHF band plan for repeater channels R8 and R9 on 145.800 and 145.825 MHz respectively, the SSA suggests one solution: channel R9 should be moved to 145.575 MHz (output). The beacons that might be interfered with on 144.975 MHz (input) should be moved. If and when the satellite organizations move away from 145.825 MHz, R9 repeaters could move back to their original frequency.

Furthermore, the SSA suggests that each IARU member society issue an amateur-radio traffic handbook in their own language, in addition to articles about rules and regulations, to be published in the member magazines. The lack of obedience concerning international telecommunication rules and regulations might partly be due to lack of knowledge and understanding.

SSA MEMBERSHIP FEE

The 1984 membership fee is 195 Swedish kronor (approximately 25 US dollars). The league issues the membership magazine, *QTC*, eleven times a year, runs the QSL bureau, and serves Swedish radio amateurs in various important ways. The work for the club is done voluntarily. The only salaried employees are clerks at the headquarters in Stockholm.



WEST GERMANY

Ralf Beyer DJ3NW
Opferkamp 14
3300 Braunschweig
Federal Republic of Germany

INTERRADIO '83

On the world's largest fairgrounds, the Interradio '83 opened its gates from October 28–30, 1983, in Hannover, Germany.

Because of the size of the exhibition area and the various activities taking place at the same time, I first found myself at a poultry show. But finally I arrived at hall 19, the place to meet radio amateurs, computer freaks, electronics hobby enthusiasts, and a fair number of equipment and component manufacturers.

The approximately 50 booths were occupied by a dozen equipment manufacturers, half a dozen computer firms, a similar number of component manufacturers/distributors, and some firms offering software support, books, and miscellaneous material needed to organize the ham shack. More than a dozen institutions were represented, including the national radio-amateur organization DARC, AMSAT-DL, DIG, and others.

About 8500 people, including the presidents of national radio-amateur societies from England, Luxembourg, Sweden, Spain, and The Netherlands, visited the convention and many of them took the opportunity to join the presentations provided in two meeting rooms. Papers presented included AMTOR, EME, and OSCAR 10. An indoor "Bier-Garten" provided plenty of room for get-togethers with old and new friends and for the usual small talk.

The meeting of the DXers saw about 100 participants and Baldur Drobnica DJ6SI showed a film about his earlier Glorioso and Juan da Nova DXpedition. Baldur answered questions on the ill-fated tour to Spratly, of course, but fortunately he was not forced to dwell on the details over and over again.

About 250 young students were shown around and many of them joined classes held on fundamentals of electronics and hands-on exercises for the construction of small electronics projects. More than 100 kits for easy-to-build electronic circuits and 60 kits for experiments with a microprocessor were sold at the show.

I enjoyed the meeting very much because of the variety of stimulating impressions, but I could not find anything on the international level which really turned me on. However, at least one interesting idea in this respect was the discussion of better support for future European DXpeditions. Existing plans to form national DX foundations seem to be channeled more and more towards a European DX foundation. A more sound financial support of DXpeditions and a better service of European needs in this field could be desirable outcomes of this move.

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PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	7	7	3A	3A	3A	3A	3A	7A	14	21	21
ARGENTINA	14	7	7	7B	7B	7	14	21A	21A	21A	21A	14A
AUSTRALIA	21	14	7B	7B	7B	7B	7B	14B	14B	14	21A	21A
CANAL ZONE	14	7	7	7	7	7	14	14A	21	21A	21	14A
ENGLAND	7	7	3A	3A	3A	3AB	14	21	21A	14	14B	7
HAWAII	21	14	7B	7	7	7	3A	14B	14	21	21A	21A
INDIA	14B	7B	7B	7B	7B	7B	14	14A	14	14B	14B	14B
JAPAN	14A	14B	7B	7B	7	7	7	7B	7B	7B	7B	14A
MEXICO	14A	7	7	7	7	7	7	14	14A	21A	21A	21
PHILIPPINES	14A	7B	7B	7B	7B	7B	7B	7B	14B	14B	14B	14
PUERTO RICO	14	7	7	7	7	7	14	14A	21A	21A	21	14A
SOUTH AFRICA	14	7	7	7	7B	7A	21	21A	21A	21A	21	14A
U.S.S.R.	7	3A	3A	3A	7	7B	14	21	14	14B	7B	7B
WEST COAST	21	14	7	7	7	3A	7	14	21A	21A	21A	21

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14A	14	7	3A	3A	3A	3A	3A	7A	14	21	21
ARGENTINA	14	7	7B	7B	7B	7	7A	21	21A	21A	21A	21
AUSTRALIA	21	14A	7B	7B	7B	7B	7B	7B	14B	14	21A	21A
CANAL ZONE	14	7	7	7	7	7	7A	14A	21	21A	21	21
ENGLAND	7	7	3A	3A	3A	3AB	7B	14	21A	14	14B	7B
HAWAII	21A	14A	7	7	7	7	3A	7	14	21	21A	21A
INDIA	14B	14B	7B	7B	7B	7B	7B	14B	14B	14B	14B	14B
JAPAN	21	14	7B	7B	7	7	7	7	7B	7B	14B	14A
MEXICO	14A	7	7	7	7	7	7	14	14A	21A	21A	21
PHILIPPINES	21	14	7B	7B	7B	7B	7B	7	14B	14B	14B	14A
PUERTO RICO	14	7	7	7	7	7	7A	14A	21A	21A	21	14A
SOUTH AFRICA	14	7	7	7	7B	7B	14	21	21A	21A	21	14A
U.S.S.R.	7B	3A	3A	3A	7	7B	7B	14	14	14B	7B	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	21	14	7A	3A	3A	3A	3A	3A	7A	14	21	21
ARGENTINA	14A	14	7B	7B	7B	7	7B	14	21A	21A	21A	21
AUSTRALIA	21A	21	14	14B	7B	7B	7B	7B	14B	14	21A	21A
CANAL ZONE	14A	7A	7	7	7	7	7	14	21	21A	21A	21
ENGLAND	7B	7	3A	3A	3AB	3AB	7B	14B	14A	14	14B	7B
HAWAII	21A	21	14	7A	7	7	7	7	14	21	21A	21A
INDIA	14	14A	14B	7B	7B	7B	7B	7B	14B	14B	14B	14B
JAPAN	21A	21	14B	7B	7	7	7	7	7	7B	14	21A
MEXICO	21	14	7	7	7	7	7	7	14A	21	21A	21A
PHILIPPINES	21A	21	14B	7B	7B	7B	7	7	14B	14B	14B	21
PUERTO RICO	14A	14	7	7	7	7	7	14	21	21A	21A	21
SOUTH AFRICA	14	7	7	7	7B	7B	7B	14	21	21A	21	14A
U.S.S.R.	7B	3AB	3AB	3AB	3AB	7B	7B	14B	14	14B	7B	7B
EAST COAST	21	14	7	7	7	3A	7	14	21A	21A	21A	21

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

February

SUN	MON	TUE	WED	THU	FRI	SAT
			1 F/F	2 F/G	3 F/G	4 G/G
5 G/G	6 G/G	7 F/F	8 F/G	9 G/G	10 G/G	11 F/G
12 F/G	13 P/F	14 P/F	15 F/F	16 F/G	17 F/G	18 F/G
19 F/G	20 G/G	21 G/G	22 G/G	23 G/G	24 F/F	25 P/F
26 P/F	27 F/F	28 F/F	29 F/F			

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T.M.

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23 reports

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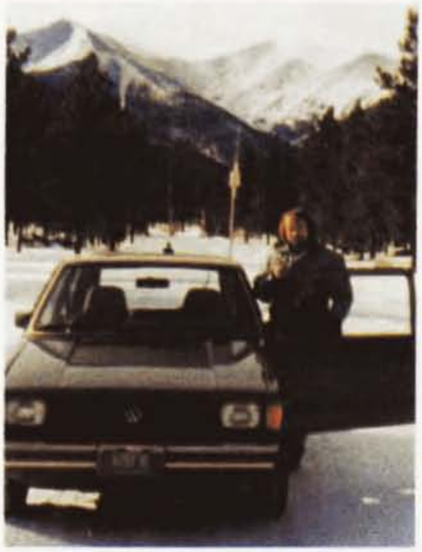
Amateur Radio's Technical Journal

A Wayne Green Publication

Malpelo—110



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INFO

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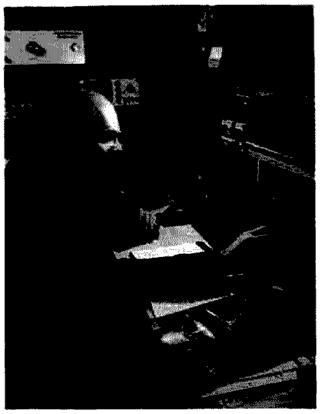
W2NSD/1
NEVER SAY DIE
editorial by Wayne Green



VIC CLARK W4KFC

News that Vic, the president of the ARRL, had died of a heart attack reached me at Comdex. I was very sorry to hear that, for Vic was undoubtedly the best president the League has had in many, many years. Indeed, I'd been working with him on the FCC's National Industry Advisory Committee just weeks ago and he had given me a lift to the airport after the meeting, giving us a chance to talk in private. I had a lot of hopes that *73* and *QST* would be able to work more closely as a result of our talks since it was obvious that our end goals were similar. Obviously, that wasn't anything I could write about while Vic was alive, and it becomes irrelevant now that he's a silent key.

What a relief it was when the ARRL board elected a president with some brains and with more of an interest in helping amateur radio than basking in the glory of being president. Vic didn't see the presidency as an honor, but as a challenge.

He had his hands full, keeping him from being able to make fast headway. On the one hand, virtually all of the dedicated League old-timers had gotten fed up with Baldwin when he was General Manager and left HQ. And there were still far too many CW-forever old-timers on the board, fighting change at every turn. But despite these serious handicaps, Vic was making progress.

Vic, like past president Herb Hoover, Jr., was interested in what he could do for amateur radio. We've had a serious loss.

HELLO, *COLUMBIA!*

W5LFL went up while I was off at the Comdex show in Las Vegas, so I missed the first few orbits. Comdex is a computer show—about 1,400 exhibits and 5,850 booths this year. That allows about one minute per exhibit—20 seconds per booth if one does not eat, rest, or go to the bathroom during show hours. It does not allow time to whip out an HT and try for W5LFL.

Since a surprising percentage of the successful computer firms are run by hams, I had a steady stream of 'em coming to the Wayne Green booth to say hello all through the show. Many of these chaps got fired up by my editorials back in 1975 and 1976 when I pointed out that hams had an edge in computers and that microcomputers were going to turn out to be a huge business eventually.

Once back home, I checked with the managing editor of *73* to find out the *Columbia* orbit schedule. Armed with that and the frequencies to be used, I headed for my ham shack. Split frequency can be a problem, but fortunately I had the KLM OSCAR rig handy.

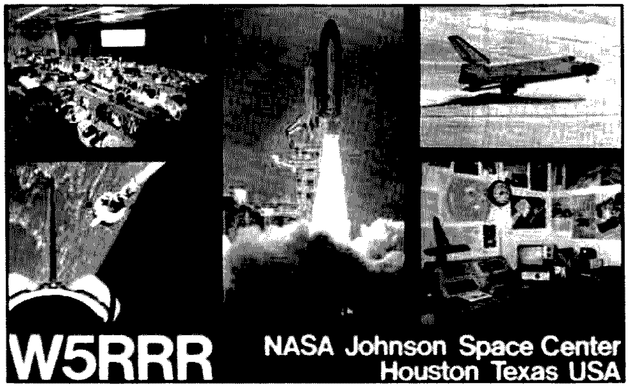
The repeater antenna should do the job okay. I hooked it to the KLM and started looking through the pile of microphones for the right one. I tried one after another with the four prongs.

Continued on page 130

ENCODED CODE

Congratulations to Verle D. Winningham K8VW of Fenton MI, winner of our first "Encoded Code" contest (January, pages 46-50). Other top finishers (in order) were Perry Donham KK2Y (Barneveld NY), Donald Bailey KB5BD (Nocona TX), David Rollins W7ILN (Las Vegas NV), Ron Sinclair KA1KTI (Epping NH), and Paul Gili N1CES (Brookline NH).

The solution is: "FIRST DECODING MAILED BURNETT YIELDS FIFTY DOLLARS." No, we're not going to tell you how to get it. Yes, "winning ham" sounds a little fishy to us, too.



QSL OF THE MONTH

To enter your QSL, put it in an envelope along with your choice of a book from *73*'s Radio Bookshop and mail it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not in envelopes or without a book choice will not be accepted.

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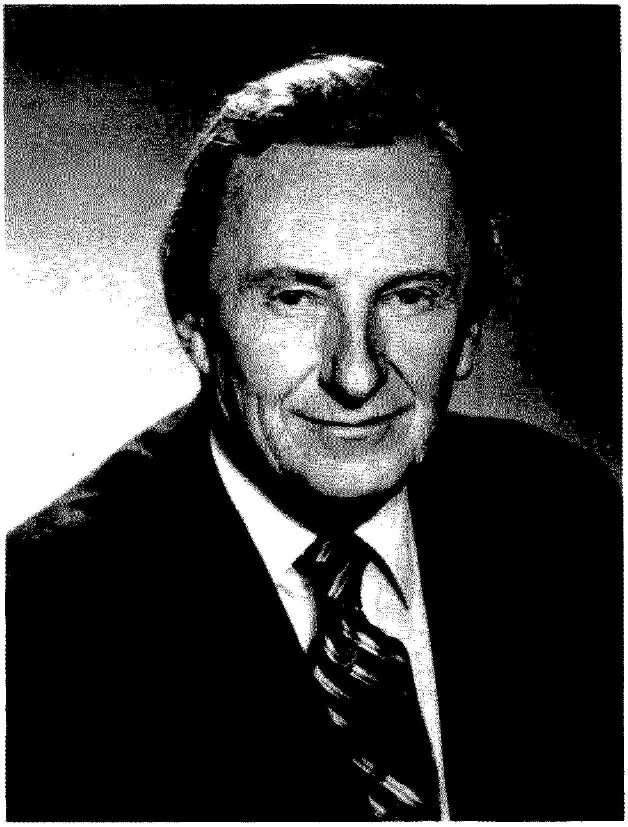
In Search of the Shuttle: Fun, Frustration, Fatigue

From Maine to Hawaii, our special correspondents gave W5LFL their best shots. Thank them.

K6DUE

Roy Neal K6DUE
NBC News
3000 West Alameda Avenue
Burbank CA 91523

Owen Garriott was flying over California when I heard him. It was his first time on the air from *Columbia* and he was full quieting on a hand-held with a rubber duckie. He was over California and I was in a hotel room in Nassau Bay, Texas, fifteen hundred miles away. It was a moment of incredible elation. We had done it! After more than 20 years of trying, *WE HAD DONE IT!* A ham was operating from space and a lot of people had made it happen, each contributing according to his expertise.



Roy Neal K6DUE

In the beginning, when NASA first flew its funny little (early) satellites, we hams had a field day, listening to the signals from space and watching orbiting *Echo* balloons blinking like stars in the twilight as we bounced signals off their sides. And we amateurs suggested to the then-new Space Administration that the Amateur Radio Service could form the cadre of a ground-based tracking network for all kinds of projects. We had operators and equipment and the will to participate.

But NASA, in that era, was extremely bureaucratic. They ignored us. Shortly before Alan Shepard flew the first manned mission, Colonel John "Shorty" Powers spent an evening at my home while I worked twenty meters. Paths were open worldwide that night and he talked with stations in Australia, South Africa, Europe, and South America. Powers took notes that night and went back to Project Mercury. As its Public Affairs Officer, he had influence. He recommended formalizing arrangements through the ARRL to form an emergency or backup communications network with the Amateur Service and using beacons on board the spacecraft.

The NASA management of that time refused to listen to anyone outside the agency. That's the same management that turned down an offer of a million dollars from the television networks at the outset of the Gemini Program to be used to provide on-board video. We were told, "If you want to give a million dollars, we can find better ways to spend the money." Today, by comparison, NASA provides very fine television indeed, partly as a way of maintaining public interest in its budget.

As time went on, Doctor Owen Garriott became an astronaut and so did Tony England. What set them apart from other members of the corps was that they were licensed amateur-radio operators, W5LFL and W0ORE, respectively.

In 1972, Garriott was named to fly . . . in *Skylab*, for two months in space. He and a dedicated group of hams at what was then the Manned Spacecraft Center in Houston applied for permission to carry amateur radio into orbit. Dick Fenner W5AVI even figured out how to do it technically. After all, W5LFL would be up there for quite a while with enough free time to enjoy a little relaxation. They were turned down again. No room for an antenna, the possibility of RFI, and lack of power on *Skylab* were cited as reasons, but the fact of the matter was that no one at NASA was on a high enough administration level willing to accept the responsibility of making a decision.

As a network correspondent specializing in aerospace and a producer who managed the pool radio and TV coverage for the combined networks of the world on the Shepard flight and *Apollo 12*, the second flight to the moon, I have known most of the principals at NASA. I worked with them, covering the

space program from the day it began, but my repeated requests and suggestions concerning the possible service of amateur radio in space fell on deaf ears. While the Air Force and the European Space Agency provided launch vehicles for piggyback rides that put amateur satellites into space, no one was able to dent the consciousness of the higher powers in NASA until the space shuttle.

With the advent of the shuttle, the door began to open. Space should be all things to all people and NASA's changing management wanted to investigate ways to make that happen.

Among the key men in management of the new regime, in charge of the shuttle program for the Space Administration, was AF L/Gen James Abrahamson. "Abe," as he is known, is a man of immense imagination with great ability in the engineering world to get things accomplished. He also is one of those rare individuals . . . a public figure who is willing to expose himself frequently to the media.

And so it happened that I was doing a rather routine interview with the General last fall, during a mission. During a quiet moment, while the camera crew was changing locations, I launched into one of my favorite themes. "Abe," I asked, "has anyone ever mentioned ham radio on a space shuttle to you?"

"No," came the answer, "but I'm interested. What do you have in mind?"

And so it began. We went on with the interview; when it was finished, we went back to discussing the Amateur Radio Service. I showed him my 2-meter transceiver. We talked for perhaps ten minutes, then General Abrahamson said: "I like it, Roy. Why don't you get a formal proposal together. If it makes sense, I'll approve it."

I floated out of the office and, quite literally, ran across the campus of the Johnson Space Center to the office of Chuck Biggs KC5RG, the Chief of Public Services. We called Doug Ward WA5SFY, who is Deputy Director of Public Affairs at the center. These men had been major supporters of the move to get ham radio into space over the years, and now it was time to start moving on what could be the most exciting DXpedition of all time.

W5LFL LOG
(Preliminary)

If you attempted to reach W5LFL and your callsign is not in the first list, look for one resembling it in the list of incomplete calls. To claim a contact, send as much information about your transmission as possible to ARRL Headquarters, Attn: W9KDR, 225 Main Street, Newington CT 06111.—Tnx W9KDR and KB1N.

AA6S	K5ADQ	KS1S	VE1BB	W5PNY
AB7C	K5CAY	KT1U	VE1CAW	W5RRR
AE7Q	K5IH	KXØO	VE1CGY	W5UN
AJ6L	K5OKG	KX6C	VE1OC	W6KH
AL7W	K5OXE	KY4Z	VE1UT	W6LEV
CE3CKE	K5QHF	KY7B	VE3BNA	W6YBL
CE3AHD	K6DYD	NØCOX	VE3BNO	W6YX
DC6SN	K6GSS	NØIS	VE3KLW	W7AVD
DC6AH	K6LY	NØLL*	VE3KRP	W7BGH
DC8AM	K6MYC	N2EK	VE4OO	W7ID
DF6UQ	K6TDR	N4GAN	VE7BOQ	W7KMF
DG6NAA	K7GIJ	N4HY	VE7CYB	W7RV
DJ1IJ	K7ND	N4JBK	VK1BX	W7SW
DK6RX	K7SMV	N5BLZ	VK1DF	W7KYN
DLØDAA	K7UGA	N5DDT	VK1ORR	W8AC
DL1YCA	K8CS*	N5EZM	VK1RR	W8FQK
DL9GAK	K8KNT	N6AVR	VK1ZAH	W8GUS
DL9MH	K9BI	N6DD	VK1ZIF	W8WN
EA3AWD	K9HMB	N6ECL	VK1ZQR	W9KDR
EIØRTS	KAØPGN	N6JM	VK2KPG	WAØVJF
EI3FI	KAØY	N6NB	VK2PMN	WA1BAR
F1FVX	KA2BTD	N6QP	VO1BK	WA1FCK
F5AD	KA4WJA	N6RJ	VO1DI	WA1JXN
F6AVG	KA5FPV	N7ARE*	VO1FP	WA1PSI
G4UYL	KA6DQZ	N7BHC*	VO1FR	WA2BSH
G6DEF	KA7GHR	N7DOF	VO1GG	WA2CHY
G6EGY	KB4CRT	N7WS	WØPHD*	WA2SEF
GM8NXC	KB4WM	N8DEJ	WØPN	WA2VMS
GW6OJK	KB6AMN	N9GA	W1AW	WA2WVL
HH2CX	KB6TN	NG5P	W1PSG	WA4BEV
I1NRF	KB6V	NM5I	W2EFL	WA4BZJ
I5FBP	KC4P	NN6E	W2GDV	WA4EWA
JY1	KC7EM	NR4P	W2JNO*	WA4GIJ
KØLIR	KC8KE	NT6G	W2NQ	WA4KXY
KØRI	KD5JH	OE6WIG	W2PAU	WA4LZR
KØRZ	KD6LQ	OE7FRH	W3CWG	WA4MMD
K1IKN	KD7IY	OF2XN	W4AQL	WA4PLR
K1PAD	KD7RF	OH3XA	W4BE	WA4SBC*
K1PXE	KE5C	OK1DFG	W4KYL	WA4TNV/KL7
K2IBP	KE6VK	OK1DIG	W4MOP	WA5AFO
K2OVS	KE6XJ	OK1KRA	W4ODW	WA5DBY
K2RIW	KFØM	OK2BDS	W4ROA	WA5DXR
K2TTI	KF4SX	OK3CGX	W4WJ	WA5NOM
K3DI	KF6Z	OZ1DPR	W5FF	WA6CFM
K3NV	KI7L*	OZ1ELF	W5GEL	WA6IUM
K3PGP	KNØL	SM2KT	W5HTK	WA6KNR
K3TC	KN2D	SM4CLU	W5HUQ	WA6PEV
K4GFG	KQ5D	TI3DJT	W5LFG	WA6RLV
K4JT	KQ5W	VE1AFU	W5LUU	WA6SGK

WA6YBT
WA7BJU
WA7DPM
WA7JUO
WA7RQS
WA7UIB
WA8KEM
WA8MTI
WA8TXT*
WBØSWD
WBØTTW
WB2ONA
WB4EMI
WB4YJC
WB4YUD
WB5AZI
WB5DSH
WB5PDW
WB5RRR
WB5VZL
WB6DEO
WB6DTR
WB6GYE
WB6IDK
WB6NOA
WB8NWY
WB8PAT
WB9MSV
WDØFOY
WD4FAB
WD4IYS
WD4KSN
WD4RJI
WD4VCS
WD5BPB
WD5IFB
WD5KBZ
WD6AUS
XE1ALQ
XE1FV
XE1TU
XE2RCP
YU7KN
YU7MAU

*Heard on CW

Incomplete Calls

Orbit 40
W5V—
KA—
—AJW

Orbit 56
WA7RV—
W7Q—

Orbit 71
W5U—Z
WA7——V
WB5—B—
—5RN
WD5CG—
WA4DN—

Orbit 97
K5A—

Orbit 111
OE7U—
DL9—
HG8—N
DHØAA—

Orbit 113
WA4N—
K2U—

Orbit 130
WA6G—
K5—V
WA6—
WA2VW—

Orbit 134
KA7—
KR8—
N8C—
W4—

Orbit 135
WB5L—J
—6E
K5D—
—1IX

Orbit 144
—XC
WD4—
KA1—
—QG
—A—A
—1DCR

Orbit 145
—ZPR
WB2JS—
—YW

Orbit 146
W7—
VE3J—

Orbit 149
VE3—
WBØC—

Orbit 150
WA7—
AD1—

We decided that the project would require sponsorship to stand any chance of approval . . . a nice, clean, nonprofit sponsorship such as the American Radio Relay League could provide. The League and other advisors at NASA Headquarters soon added a partner, the Amateur Satellite Corporation, AMSAT, to handle technical details in discussions with NASA.

Vic Clark, that brilliant man who was President of the League for too short a time, accepted the basic concept on my first phone call and promised to do his best to steer it through League channels. We talked about a videotaped documentary to be made under ARRL auspices. Our NASA friends suggested it would help in getting the agency's final approval. For the Amateur Radio Service, it would be a way of telling everyone in Owen Garriott's own words what he was trying to do. And, if we also showed what ham radio is all about, it might even attract the public.

In November, 1982, I sent a letter to Vic which he took to the Executive Committee, where it cleared its first hurdle, then it went on to the Board of Directors where "Amateur Radio's Newest Frontier" was authorized and its financing approved. Dave Sumner K1ZZ accepted the project as the League's General Manager and almost immediately became an enthusiastic supporter. Dave was another of the key figures that guided the project and made it happen.

In California, a group of amateurs who are also thorough television professionals volunteered their services. Bill Pasternak WA6ITF, a master maintenance technician at Metromedia in Hollywood, became Technical Supervisor and Field Producer for the documentary. Alan Kaul W6RCL, NBC's Nightly News West Coast Producer,

produced "Amateur Radio's Newest Frontier," and Frosty Oden N6ENV, who wins awards as a top editor at CBS, turned our tapes into a highly professional package. Howard Mark WØOZC reproduced them by the thousand and Pete O'Dell KB1N took care of the distribution through the League's Board of Directors. The tapes brought amateur radio in orbit another big step forward.

But all of that was predicated on NASA approval, and the politics of the agency present a fascinating illustration of what it takes to make things fly in government circles these days.

Doug Ward forwarded a memo to Brian Duff, NASA's Director of Public Affairs at that time. Duff assigned Dick Daniels W4PUJ, Director of Management Support at Headquarters, to study the project. It was at this point that Daniels made the recommendation and AMSAT joined the project. Bill Tynan W3XO for AMSAT and Dick Fenner W5AVI for the Johnson Space Center put together a draft proposal. It was a wonderfully worded document that stressed key factors. The project, it said, would appeal to the youth of the nation. It was firmly supported by prestigious organizations and made technically practical by advances in technology such as tiny transceivers and reliable battery packs that could be space-flight qualified.

Duff gave the draft proposal an enthusiastic endorsement and forwarded it to Robert Alnutt, the Acting Associate Administrator for External Relations. Alnutt endorsed it, dependent on "the various constraints in operating the shuttle." He referred the documents to General Abrahamson and to Gerry Griffin, the Johnson Center Director. And now we had come full cycle.

Owen Garriott W5LFL was scheduled to fly on STS-9 in the fall and that, for a time, looked like a roadblock. The cargo was dedicated entirely to the European Space Agency's Spacelab and the manifest had been closed for months.

Center Director Griffin lent his enthusiastic support, clearing the hurdles of astronaut assignments and training and authorizing supervisors to permit Dick Fenner W5AVI and the many other hams at the center to go about finding, designing, and testing equipment to ensure compatibility.

When the paperwork reached Harry Kraft, the Spacelab Program Manager at the Marshall Space Flight Center, he was approached by a number of ham operators on his staff. They convinced him that the project was worthwhile.

From the outset, the experiment was earmarked Public Affairs and was to be conducted at times when it would not interfere with Owen's Spacelab duties.

Ward, in Houston, was a key figure in guiding the project through the shoals of all these politics and, more than coincidentally, keeping Owen Garriott advised as the logjams were cleared.

And finally . . . on April 16, 1983: Vic Clark and I were in Sioux City, Iowa, at a ham convention when he got a telegram. If the equipment could be made to work compatibly and if no other complications were discovered, permission was granted to fly an amateur 2-meter transceiver on the flight of STS-9, to be operated by Dr. Owen Garriott in his off-duty time. I remember Vic's enthusiasm and how quickly it spread to the hams at that convention. It was an enthusiasm we were to see repeated at many other places we traveled together that year, telling audiences what to expect.

A month later, at the instigation of Doug Ward, there was a key meeting at the Johnson Space Center and that is where the plan really came together. Peter O'Dell KB1N, the League's Public Relations Coordinator, and Bernie Glassmeyer W9KDR had been brought in to handle the intricate details of getting out information to the members.

Vic Clark was there, of course, and so was Vern Riportella WA2LQQ, President Elect of AMSAT. Vern accepted responsibility for clearing frequencies. For NASA, there was Dick Fenner to describe the Motorola transceiver that had been chosen and the battery packs that would power it. Dick described a special antenna that had been designed and built by the hams of the Johnson Center Radio Club. R. W. "Bob" Harris was there, representing the Flight Directorate. Bob was responsible for putting out the orbital tracking information that later permitted hams all over the world to know when to listen for Garriott. Charles Chassay represented the Shuttle Program Office. He was, in the final analysis, the man who approved the on-board equipment.

But the most important member of that meeting was astronaut Owen Garriott W5LFL. His background as an electrical engineer led the discussion as it wove through the intricacies of equipment planning. His communication knowledge paid off handsomely as plans were made for what would eventually be the *modus operandi* of his time on the air. We discussed the use of a tape recorder and an astronaut's lightweight headset . . . the transmit and receive cycles. An amateur-radio flight plan was built in Houston on that day in May and it worked when W5LFL finally went on the air in December.

There's a lot more to the story of Owen Garriott's major step into the newest frontier of space and there are many more people who played key roles and should be mentioned, but time and space don't permit much more.

The dedication of Doug Ward, Dick Fenner, and a couple of dozen fellow hams in Houston and another group of equally dedicated amateurs at the Kennedy Space Center who repaired the transceiver and nursed it through a siege of rf interference aboard the *Columbia* cleared the technical hurdles prior to the mission.

Pete O'Dell KB1N and Wayne Yoshida KH6WZ worked for months before the flight and then around the clock at the Johnson Space Center to get out the word of Owen's feats as he worked (King Hussein JY1, Barry Goldwater K7UGA, his mother through club station W5HTK in Enid, Oklahoma, and his sons at the Johnson Space Center station). Pete's work in particular deserves a medal. He made it all work for the League. The center club's President Dale Martin KG5U and its many members were on the air around the clock, passing the latest word on orbits as fast as they got the in-flight changes from Bob Harris and Doug Ward.

The tenth day in space, the bonus day, was the best of them all. Owen worked dozens of stations and was heard by thousands even though orbital information was sketchy.

And it was then . . . to this reporter . . . that the whole flight seemed to come into focus. This really was a big deal . . . the fraternity of ham radio had seen one of its members do something exceptional. Owen Garriott, astronaut and W5LFL, had turned in another flawless performance in space. His fellow hams, here on Earth, had begun to achieve a little maturity on that final day in the places that needed to grow up. Most of the high-powered hogs who tried to ride roughshod over their neighbors had finally realized that signals from space would come through no matter what they did to interfere and that their chances of being heard were only a little better than the little guys.

And on that day, during the several great passes over the United States, all of us had good reason to be thankful . . . to Owen for a great flight, to General Abrahamson and to NASA for opening the doors of space to amateur radio, and to Vic Clark and the ARRL for the backing and support that made it all possible.

Amateur-radio operator Roy Neal began hamming in 1934 when he was first licensed as W3GIB in the Philadelphia suburb of Wayne, Pennsylvania. From home-brew equipment he migrated into early experimental work, including aeronautical mobile transceivers on 5 meters.

Immediately following World War II, Neal went back on the air as D4ACA, in Hochst, Germany. He was Program Manager for the American Forces Network in Europe and handled phone patches by the hundred.

Post war, back in Philadelphia, W3GIB was among the early experimenters with triband antennas and two-meter relay stations (known today as repeaters).

When he went to California in 1952, Roy picked up his present call, K6DUE. Active on most amateur bands ever since, he currently operates 220 MHz, 2 meters, and the 10- through 75-meter bands with occasional forays into satellite tracking to spice a diet of DX and mobile QSOs.

He is probably best known in the amateur fraternity because of his documentaries for the ARRL, "Moving Up To Amateur Radio," "The World of Amateur Radio," and "Amateur Radio's Newest Frontier."

WA6ITF

Bill Pasternak WA6ITF
Associate Editor
28197 Robin Avenue
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I have no real story to tell. At least not this time. I was not among those lucky enough to contact Dr. Owen Garriott W5LFL as he traveled around the world on the spacecraft *Columbia*. I did hear him. In fact, I heard him make his very first QSO with Lance Collister WA1JXN in Frenchtown, Montana, about the time Owen was overhead on orbit 35, flying down the Pacific coastline. I was standing in the courtyard of Metromedia Square in Hollywood where I work, listening to 145.55 MHz on an Icom IC-2AT hand-held. The self-appointed "channel cops" were there, jumping on everyone's case if they "dared" to say a word on .55. There were even a few "touchtone jammers" playing their game, but all went away as W5LFL's booming signal from 200 km above us totally captured the channel. I listened as Owen first called CQ and a bit later began acknowledging the calls of those he was hearing. The output of the hand-held was patched to a cassette tape recorder and I to the latter through a pair of Senheisser earphones. I just stood there under one of our huge satellite antennas, leaning against a tree, knowing that Owen Garriott W5LFL's dream of becoming the first ham to operate a station from space had come true. I also knew that words penned by my friend Roy Neal K6DUE held new meaning. Many of you have probably heard them in the closing moments of the video presentation, "Amateur Radio's Newest Frontier." "Space has a future and amateur radio expects to be a vital part of it . . . the flight of Owen Garriott is only the beginning."

Indeed, W5LFL's flight on *Columbia* was "only the beginning." It was the start of a whole new era in the evolution of the Amateur Radio Service. Until now, amateurs had to be content with using objects such as the OSCAR-series satellites as "repeaters in space." Now, suddenly, a man had done what many thought would never happen. A

man had successfully contacted others on a one-to-one basis from Earth orbit, without the aid of NASA communications channels. He did it with the most basic of equipment: a 5-Watt hand-held and battery-powered radio and a simple antenna held to the aft flight-deck window by several strips of Velcro®. Other than the radio having to meet NASA specifications to be carried on board *Columbia*, there was really nothing special about Owen Garriett's station other than its location. Its utter simplicity raised many questions, not the least of which was "will it work, and if it does, can contacts be made and QSOs held?" We all now know that the Motorola talkie and home-brew antenna performed far above expectation. Owen proved that low power and a simple antenna could provide backup communications from Earth orbit. Indirectly, he even showed the possibility of direct personal communications from space in future times when passengers are taken into orbit. What Dr. Garriott did also gave new information about our service to the non-ham populace of the world. Never before had anything like this been attempted and the world's press corps was glued to the "happening" as it unfolded. The reports in newspapers, on the radio, and on television around the world showed hams as the pioneers of communication and finally dispelled the myth that radio amateurs were eccentric tinkerers who dwelled in attics and basements surrounded by sparks and wires. For a moment, we were the center of attention; it was an opportunity well used to bring amateur radio out of the proverbial closet forever.

Knowing that there would be many stories to tell about the flight of STS-9 and attempts by ground-based stations to garner a fleeting QSO with W5LFL, *73* commissioned 21 amateurs across the nation to keep diaries of their day-to-day efforts to make a contact. Those involved were as far east as New York and New England, as far west as California, Oregon, and Hawaii, as far south as Florida, and as far north as Alaska. Each ham has his own story. Each will have something a bit different to say and by reading their combined reports, you will get a graphic idea of what most amateurs around the world experienced during 6 of the 9 days of the flight of STS-9. First, we travel to Maine to find out how K1EFZ made out in his quest to contact Owen Garriott W5LFL, the first amateur to operate from space.

Ham it up!

Maine waits for space talk

Press Herald
Dec 1, 1983

✔ All eyes were on the eyes of shuttle crewman Robert Parker Wednesday. Page 15.

✔ Spacelab's astronauts created brilliant flashes of blue light. Page 2.

By DIETER BRADBURY
Staff Writer

"Ham" radio operators across Maine will have their ears glued to their receivers this morning in an effort to communicate with the orbiting space shuttle Columbia.

Astronaut Owen Garriott, a mission specialist on board the Spacelab and an amateur radio operator, is carrying a five-watt, hand-held transceiver on board the flight.

During his off-duty hours, he will be trying to communicate with some of the thousands of ham radio operators around the world. If a link is established it would be the first amateur radio communication between the earth and a manned space vehicle.

The best time for communication with the Spacelab for hams in the northeastern United States will be between 10:27 and 10:47 a.m. this morning, according to the American Radio Relay League, a national organization of radio amateurs.

The shuttle will be in its 49th orbit, making a pass across the country that takes it over parts of the eastern seaboard during that period, the ARRL said.

Dana Luke of Westbrook, a ham who edits a statewide newsletter for radio enthusiasts, said he expects many of Maine's 2,464 hams to be at their sets during the orbit.

"It's the big topic of discussion every time you tune in on your set," Luke said. "Everybody's talking about it. I'm going to have my radio on, and I've got the capability to pick him up."

Under a plan developed jointly by NASA and the ARRL, Garriott will alternately transmit and receive for one-minute periods of up to an hour

During an even-minute period, he will identify the geographic area he will listen for and describe crew activities or views of the earth. During the odd-minute period, he will scan his receive frequency, 145.55 MHz, for call signs from the designated area.

In his next even-minute transmission period, he will then acknowledge any call signs he has received. Unless Garriott requests otherwise, hams will be limited to transmitting their call signs only

K1EFZ

Robert N. Harnois K1EFZ
56 Pennell Street
Westbrook ME 04092

When this space-shuttle project was first announced, I had no idea that I would be involved to such an extent, but after the call from Jack Burnett on November 27, 1983, I suddenly was in the middle of it.

Having built the turnstile antenna described in the September *QST*, I was already prepared to listen and possibly make a call or two if the occasion arose.

On November 28, at 1100, I watched the shuttle take off and then figured out the orbit times for my location that Jack had given me. Didn't do any more until Wednesday.

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                  SCHEDULE FOR SPACE SHUTTLE
                 LAUNCHED NOV.28.1983 AT 1100

LOG OF CONTACTS WITH    W 5 L F L

ORBIT      DAY     HOUR  MIN          HOUR  MIN      AREA
34 A        2       1    10            1    25       CENTRAL
       NOV 30     1210                1225
     LISTENED FROM 1130 TO 1330. NOTHING HEARD
     COPIED LATEST ARRL BULLETINS ON RTTY
-----------------------------------------------------------------
39 D        2       9     0            9    25       CENTRAL
       NOV 30     2000                2025
     UNABLE TO LISTEN AT THIS TIME
-----------------------------------------------------------------
49 A        2      23    27           23    47       EASTERN
       DEC 1      1027                1042
     DURING THIS TIME W5LFL WAS BEING INTERVIEWED BY ROY NEAL
     ON LIVE TV.  NOTHING HEARD
-----------------------------------------------------------------
70 D        4       7    15            7    25       EASTERN
       DEC 2      1805                1825
     LISTENED FROM 1800 TO 1830. NOTHING HEARD
-----------------------------------------------------------------
71 D        4       8    35            8    50       CENTRAL
       DEC 2      1935                1950
     NOTHING HEARD AT THIS TIME.
-----------------------------------------------------------------
96 A        5      21    25           21    45       EASTERN
       DEC 4      0825                0845
     HEARD W5LFL LOUD AND CLEAR AT 0836.HE WAS OVER FLORIDA
     CALLED HIM TWICE. NO CONFIRMATION. NOT HEARD AGAIN
-----------------------------------------------------------------
97 A        5      22    55           23    23       CENTRAL
       DEC 4      0955                1023
     NOTHING HEARD AT THIS TIME. REPORT OF SOME RECEPTION BY
     OTHER PEOPLE
-----------------------------------------------------------------
112 A       6      21    13           21    25       EASTERN
       DEC 5      0813                0825
     HEARD W5LFL AT 0826, RATHER WEAK. HEARD HIM AGAIN AT
     0827, LOUD AND CLEAR.CALLED HIM TWICE. NO CONFIRMATION.
-----------------------------------------------------------------
113 A       6      22    42           23     5       CENTRAL
       DEC 5      0942                1025
     NOTHING HEARD AT THIS TIME.
-----------------------------------------------------------------
129 A       7      22    29           22    50       CENTRAL
       DEC 6      0929                0950
     UNABLE TO LISTEN AT THIS TIME
-----------------------------------------------------------------
133 D       8       4    44            5     6       EASTERN
       DEC 6      1544                1606     ** (NEW ENGLAND)
     NOTHING HEARD AT THIS TIME
-----------------------------------------------------------------
134 D       8       6    18            6    48       CENTRAL
       DEC 6      1718                1748
     NOTHING HEARD AT THIS TIME
-----------------------------------------------------------------
144 A                                                EASTERN
       DEC 7      0800
     UNABLE TO LISTEN. HEARD REPORTS ON THE AIR THAT W5LFL
     LOUD AND CLEAR IN THIS AREA.NO CONFIRMATIONS.
-----------------------------------------------------------------
145 A                                                CENTRAL
       DEC 7      0930
     UNABLE TO LISTEN. REPORTS FROM OTHER LOCAL HAMS THAT
     W5LFL WAS HEARD LOUD AND CLEAR ON THIS ORBIT ALSO.
-----------------------------------------------------------------
160 A                                                EASTERN
       DEC 8      0749
     LISTENED IN CAR ON WAY TO WORK.SQUELCH WAS BROKEN
     SEVERAL TIMES BUT DIDN'T HEAR ANY VOICE.
-----------------------------------------------------------------
161 A                                                CENTRAL
       DEC 8      0920
     UNABLE TO LISTEN AT THIS TIME.
-----------------------------------------------------------------
       DEC 8      1847
     WATCHED THE LANDING ON TV.
-----------------------------------------------------------------

           LOGGED BY ROBERT N HARNOIS, K1EFZ
                      56 PENNELL ST
                      WESTBROOK ME 04092
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Robert N. Harnois

Robert N. Harnois K1EFZ

In the meantime, I copied the RTTY bulletins from the ARRL and got the latest info on all the orbits. Also have been continuing receiving these bulletins every day.

The log explains my participation in monitoring the shuttle.

I was very pleased to be asked to participate in the telephone conference on Sunday, December 4, 1983. It was very interesting and informative and I wish I could have had more to report, but it seems that our location did not get the results that some of the other areas had. It was wonderful to be in such high-class company. Thanks for asking me.

I did not hear any malicious interference, only over-anxious and possibly misinformed operation—but nothing serious.

My station consists of a KDK 2016A on two meters with a five-element vertical beam up 60 feet. The turnstile antenna was added for this project. On HF, I have a Heath SB-104A and a TRS-80 Model 4 computer with the ROM-116 interface for RTTY. Have been a ham for 26 years; am a member of QCWA. I am retired from the US Postal Service. I work a couple days a week at a direct-mail service. For other hobbies, I am an avid tennis player, playing three times a week year round, and am a percussionist in the Portland Community Symphony Orchestra and the S. D. Warren Band in Westbrook. Do my own house repairs and like to build furniture. Of course, this computer that I'm using for this report is also one of my hobbies.

I am 69 years old. Having lost my first wife in 1978, I was remarried in June, 1982, to a very lovely lady who was also a widow. She had eight children and I suddenly had a lovely family with five grandchildren. We have a very happy life. We usually go to Florida every year for a month or so. I have one daughter who is also a ham operator; her call is K1GSF.

Three clippings from the Portland papers are the only ones I have seen so far. Have not seen any local TV coverage, but there could have been some that I missed.

The participation by the amateurs in this area was very enthusiastic and everyone is hoping that they were heard by W5LFL's receiver. I don't know of anyone who was acknowledged.

WB1BRE

Bill Burden WB1BRE
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Nashua NH 03060

Members of the Nashua Area Radio Club prepared for the flight of the space shuttle *Columbia* for several months. Bob Wolf N1ABA and George Murphy K3RQ had been very active in working amateur satellites for several years, and the challenge of working STS-9 was a natural for them. Media interest was building up to the mission partly as a result of the Grenada situation that occurred about a month before the launch. I had not really set up anything at my home for monitoring the shuttle since I planned to go to Bob's house during the passes when W5LFL was on the air.

I was at Bob's shack during the first pass on Thursday, December 1, 1983. Present were reporters from the local papers, the *Nashua Telegraph* and the *Manchester Union Leader*. The shuttle came over, and with George at the azimuth and elevation controls and Bob at the 2m rig, the call was sent out. Unfortunately, Owen was in a news conference at the time of the pass, so all we heard was several minutes of noise punctuated by people mistakenly transmitting on the downlink. This all was slightly discouraging, but not to worry—there were many orbits to go!

The east-coast pass on Friday night (December 2) was to be a good one, but this was the night of the club annual Christmas party! We toyed with the idea of bringing a rig to the party, but rejected that as a bit of an overkill for a party. George K3RQ was coming to the party, but he delayed his departure long enough to make a try at a pass.

Again, nothing from the spacecraft, but George was undaunted. He proceeded to get ready for the Christmas party and George and Charlotte made a spectacular entrance!

I received a call from Jack Burnett at *73* informing us that we had been selected as one of a group across the country to keep a diary of our attempts to contact the shuttle. We were astounded to be included in a select group like this. I discussed this with Bob and George and we all suddenly realized that we were into paperwork!

Sunday night (December 4), Bob and I joined in the nationwide teleconference and really enjoyed the discussions from around the country. It was exciting to hear how people in various states were making out with PR and the attempts to contact Owen.

I discussed the passes scheduled for Monday morning (December 5) with Bob and agreed to meet at his house to listen to the next attempt. Sunday night was the first snowstorm of the season and several inches were on the ground by Monday morning. Bob lives about 2 miles from me via the main highway in Nashua. Monday morning it would have been easier to reach the shuttle! Traffic was tied up all over the city and I realized that I would never make it through the city. I turned around and proceeded to Bob's house via the neighboring town of Hollis. But the delay had set me back so far that by the time I got through Hollis, I realized that I would never make it to Bob's house in time. In desperation, I turned on the old Kenwood 7400 in the car, hoping that I would hear something with the quarter-wave whip on the rear deck.

At the appointed time, I suddenly heard "This is W5LFL in the spacecraft *Columbia* calling CQ North America."

I damn near drove the car off the road! He was full quieting with no flutter and no static. I listened to the whole pass and even put in some calls as I continued to Bob's house. What a thrill! I was struck by the solid link between a spacecraft orbiting the Earth 200 miles up and a commuter on a back road in a little town in New Hampshire.

Wednesday morning (December 7), I was ready at home with my 2-meter rig tied to my 8-element yagi and a tape recorder ready to go. I pointed the antenna south to try to catch as much of the pass as possible. Right on schedule, there he came! He was loud and clear and I copied three of his transmissions. My wife and I shared the headset on the tape deck as Owen called CQ.

As I tuned around the 10 transmit frequencies listening to the local hams calling the shuttle, I was struck with a vision of the view from the spacecraft if rf energy were visible. As he passed over a given area and made a call for stations, a blanket of rf energy would rise from the surface of the Earth and envelop the spacecraft!

Monday night (December 5), the Nashua Area Radio Club had its regular monthly meeting at the local library. On the agenda was a short presentation by Bob and George on the shuttle activities. By the time the meeting started, it was clear that a lot of people were there for the info on the shuttle. The tapes of the previous passes were played and the questions flew thick and fast! The repeaters were alive with people looking for orbit info and frequencies. I kept checking the articles in the local paper to see what immortal statements Bob and I were quoted as having uttered!

Bob Wolf N1ABA (left) and George Murphy K3RQ at Bob's station. Bob is operating the 2-meter rig while George is checking orbit data and running the tracking antenna

The interest in the shuttle activity is extremely high. I took the tape of the Wednesday morning transmissions into work. A small crowd quickly gathered to listen to W5LFL and was astounded by the clarity of the signal.

Station Equipment

- *Radio*: Kenwood TR-9130 multimode
- *Amplifier*: TE Systems 1412G, 150 Watts output with GaAsFET preamplifier
- *Antenna*: Cushcraft A144-10T, 10-element switchable left- and right-hand circular polarization. Antenna is 50 feet and is rotatable in azimuth and elevation.

Station Diary

August, 1983: Updated W3IWI (Tom Clark) Orbital Prediction Program to include STS-9 preliminary data.

September 12, 1983: Don Dillaby KA1GOZ of the *Nashua Telegraph* conducted interview with myself and George Murphy K3RQ.

September 13, 1983: Front-page article, with picture, appeared in the *Nashua Telegraph*

October 21, 1983: Follow-up story on STS-9 ham-in-space mis-

sion was run in the *Nashua Telegraph*.

October 23, 1983: Virginia Wegener of the *Manchester Union Leader* conducted interview with myself and George Murphy K3RQ.

October 30, 1983: Article, including picture, appeared in the *New Hampshire Sunday News* (Manchester).

November 28, 1983:

1400-1420Z: Logged into the AMSAT bulletin-board system and obtained current list of potential orbits for W5LFL.

November 30, 1983:

0200-0330Z: Checked into the AMSAT net on 3850 kHz. Received the latest inputs on projected orbit numbers for STS-9 as well as element set #MH-11-29-83. Inputs from W5RRR on the net giving calculated equator crossing times and longitudes for orbits 34A and 48A were also logged.

0330-0430Z: W3IWI computer program was updated with the new element set and orbital predictions run for the time given by W5RRR. Data correlated within 10 seconds and a fraction of a degree of equator crossing to that of W5RRR.

1721-1728Z: Monitored 145.55, 145.53, and 145.57 during orbit 34. Nothing heard even though the spacecraft was in range. No transmissions were made.

1728-1900Z: Rechecked all equipment and orbital calculations. Verified with as many sources as possible including Jim Pickard WA1PSI in Derry, New Hampshire, that no transmissions were heard in the area during orbit 34. Prepared for orbit 49 which we believe to be our best chance in this area to work W5LFL.

December 1, 1983: Newspaper article appeared in the *Nashua Telegraph* describing failure to hear W5LFL on orbit 34 which had been our first opportunity in this area.

1538-1546Z: Listened for W5LFL on orbit 49. This was the first scheduled east-coast pass and was one of the best, reaching an elevation of 42 degrees. In the shack were Bob Wolf N1ABA, George Murphy K3RQ, Bill Burden WB1BRE, Dot Burden, Don Dillaby KA1GOZ from the *Nashua Telegraph*, Virginia Wegener of the *Manchester Union Leader*, Gene Balinski WA1UXA, and Randy Ward KA9GHT. Nothing was heard, but we were informed shortly after the pass that Owen Garriott was in a press conference during this time.

1546-1630Z: Short group discussion about failure to hear anything on orbit 49. Everyone was a bit disappointed, but there was also a lot of optimism among the people present, especially when we found out about the press conference.

2000-2030Z: Calculated orbital information for orbit 57, which is due to pass overhead just after sunset. There is partial cloud cover at this time, but hope to get visual sighting to confirm orbital calculations.

2150-2200Z: The *Columbia* appeared to the northwest, just as predicted, passed to the north reaching an elevation of about 30 degrees, and went over the horizon to the southeast. It was a spectacular sight, appearing as a very bright fast-moving star. It was observed for approximately five minutes. This sighting *confirmed* the accuracy of the computer program.

December 2, 1983: Newspaper article including picture appeared in the *Nashua Telegraph* explaining our attempt to work W5LFL on orbit 49. The article explained that Owen was in a press conference at the time of the pass and for that reason was not available. Newspaper article describing our attempt on orbit 49 also appeared in the *Manchester Union Leader*.

2230-2315Z: Prepared for orbit 70. Checked all equipment and orbit calculations. Monitored WA3NAN for shuttle transmissions and additional information.

2315-2321Z: Listened for W5LFL on orbit 70 from the car en route between Nashua and Durham. Nothing heard on any of the downlink frequencies. Did not make any transmissions. K3RQ attempted to work orbit 70 from his home in Milford, New Hampshire. Virginia Wegener of the *Manchester Union Leader* was also present. Nothing was heard by George either.

December 3, 1983: No scheduled orbits for today but monitored WA3NAN on and off for most of the day. Ran orbital calculations for orbits 85, 96, and 97. Relayed information on orbits 96 and 97 via the 13/73 repeater. Orbit 85, although not a scheduled orbit for W5LFL, was predicted to pass just after sunset, and since there was no cloud cover, this was an ideal candidate for another visual sighting. If you can't hear him, at least you can see him.

2130-2140Z: *Columbia* again appeared right on schedule from the northwest, passed to the north at about 45 degrees elevation, and disappeared over the horizon to the southeast. It was just as spectacular and exciting as Thursday's sighting. Anticipation of hearing W5LFL on the downlink for the first time is building again.

December 4, 1983:

1300-1335Z: Prepared for orbits 95 and 97 while monitoring WA3NAN.

1335-1342Z: Listened for W5LFL on orbit 96. Heard and recorded two transmissions at 1334 and 1336Z while the *Columbia* was over Florida. Called on odd minutes on 145.03 MHz. Signals peaked at 59+20 dB. Antenna polarization favored RHCP. It was a tremendous feeling to hear Owen Garriott for the first time. It was hard to believe the quality and strength of the downlink signals. Many, many signals were also heard on the uplink. It is hard to imagine what it must have sounded like in the *Columbia*.

1342-1500Z: Continued to monitor WA3NAN on 40 meters and compare notes with several other stations who had heard the downlink signals on orbit 96. Talked with WA1PSI in Derry to exchange reports and check data for orbit 97. After hearing W5LFL for the first time, everyone was anxious for a second shot at it. Many people on the 13/73 repeater had not heard him or were not listening on orbit 96 but looked forward to orbit 97 after finding out he had finally been heard in the northeast.

1505-1515Z: Listened for W5LFL on orbit 97. Heard and recorded two transmissions at 1508 and 1510Z while the shuttle was over Texas and the Great Lakes. Signals favored LHCP polarization on this pass and peaked at 59. K3RQ monitored the pass from his QTH in Milford.

December 5, 1983: Newspaper article appeared in the *Nashua Telegraph* describing the transmissions heard on orbit 96 and our continued attempts to be heard by W5LFL.

1320-1332Z: Listened for W5LFL on orbit 112. Heard and recorded *four transmissions from the Columbia* as the spacecraft traveled up the east coast. Transmissions were heard at 1324, 1326, 1328, and 1330Z peaking at 59+20 dB. Called on odd minutes on several different uplink frequencies.

1332-1430Z: While monitoring the 13/73 repeater and WA3NAN *for new information, edited* the tapes for orbits 96, 97, and 112 for presentation at the Nashua Area

Radio Hams Fail In First Attempt To Contact Shuttle

By VIRGINIA WEGENER
Union Leader Correspondent

NASHUA

NASHUA — The line was busy between earth and space yesterday morning as the space shuttle Columbia slashed its way across New Hampshire skies while hundreds of ham radio operators around the state tried to get a call through But to no avail

"NOVEMBER ONE. ALPHA BRAVO ALPHA" "NOVEMBER ONE. ALPHA BRAVO ALPHA" Nashua ham Bob Wolf kept repeating his call letters over and over during the odd numbered minutes when orbiting astronaut Dr. Owen Garriott was scheduled to be listening (Garriott was slated to repeat the call letters on the even minutes, if he was able to receive and respond)

Wolf continued repeating his call letters in the hope that Garriott would hear them, while fellow ham, George Murphy of Milford, manned the antenna tracking the spacecraft as it raced along.

Fellow hams Bill Burden, president of the Nashua Area Radio Club; George Balinski and Don Dillaby, all of the Nashua club, and Randy Ward of Evansville, Ind., were all in the Wolf home on Shannee Drive in the hope of being there when Garriott broke through.

"There's only a total of eight minutes during each pass when the shuttle is in the right position to send and recieve," the various radio enthusiasts took turns explaining.

"We have 10 different frequencies we can transmit to him over.and he'll respond on the even minutes on one of three frequencies."

The spaceman-ham will only be allowed to broadcast to earth during his off times and then the most earthlings will hear is "CQ CQ, this is W5FLF calling ..." whatever call letters he has received during the sending time from earth.

"Even if he can't answer us because of his NASA comittments," another Nashua ham reported,"he'll try to record our calls so that when he gets back, we'll be notified that our calls were actually received in outer space."

Yesterday's unsuccessful attempt at communication didn't dampen the ham's enthusiasm, though. Tonight the shuttle sails over our area again and they'll all be at their respective stations at 6.15 p.m. for another try at reaching the shuttle.

Eavesdropping on outer space isn't restricted to those with ham radios, however. Anyone with a programmable seahner can tune in to frequency 145.55 MHZ while those with short wave radios can listen on 3.85 or 3.86 MHZ LSB.

But if O.G. doesn't call home tonight, he'll have one more chance to try Dec. 16.

Radio Club meeting. Exchanged signal reports and observations with many of the people who had monitored orbit 112. Many mobiles and several people with handie-talkies had heard W5LFL 59. Excitement was running high and *Columbia* fever was epidemic. Recorded element set #MH-12-5-83 for STS-9 from WA3NAN. Updated computer program and reran calculations for orbits 117, 128, 129, 132, and 133.

2109-2117Z: Listened for W5LFL on orbit 117. Nothing was heard. Transmitted on all uplink frequencies using both RHCP and LHCP during the pass.

December 6, 1983:

0000-0230Z: Nashua Area Radio Club meeting. Presented short update of STS-9 mission and played the recordings of downlink transmissions heard on orbits 96, 97, and 112. At least half of the 60 members present had heard one or more of the transmissions. Only a few had tried and failed to hear W5LFL. Dan X1XXX, one of the club members, was presented the "STS-9 COULD" award (Call On the Uplink Dummy). Note: The call has been changed to protect the innocent?

1311-1319Z: Listened for W5LFL on orbit 128. Nothing heard, but transmitted on all uplink frequencies during the pass.

2056-2104Z: Listened for W5LFL on orbit 133. Nothing heard, but transmitted on all frequencies during the pass.

December 7, 1983:

1130-1200Z: WA3NAN monitored while preparing for orbit 144.

1259-1307Z: Listened for W5LFL on orbit 144. Heard and recorded five transmissions at 1258:30, 1300, 1302, 1304, and 1308Z. AOS occurred at 1358:25 and LOS occurred at 1407:25. Signals peaked at 59+30 dB during the pass and favored RHCP at times and LHCP at other times. AOS occurred 30 seconds earlier than predicted.

2035-2044Z: Prepared for orbit 149. W5LFL has yet to appear on an afternoon pass, but will keep trying in hopes that the recorder is running.

2044-2052Z: Listened for W5LFL on orbit 149. Nothing heard, but transmitted on all uplink frequencies.

2100-2200Z: Ran computer calculations for orbits 160 and 161. Presented calculations for orbits 160 and 161 over the 13/73 repeater. Also discussed signals heard during orbit 144. Almost everybody was able to copy at least three of the five transmissions.

December 8, 1983:

1200-1246Z: WA3NAN monitored while preparing for orbit 160. Information received via WA3NAN indicated some problem with two of the computers, possibly associated with the maneuvering thrusters. At 1245 the scheduled landing was postponed until the problem with the computers was better understood.

1246-1300Z: Listened for W5LFL on orbit 160. Nothing was heard, and due to problems with the computers aboard the spacecraft, it was unlikely the recorder was running, so no transmissions were made.

Bill Burden is a native of Nashua, New Hampshire and has lived there most of his life. He is 47, married, and has three children. His wife Dot is waiting for her Novice ticket to arrive! Bill is a Program Manager at Sanders Associates in Nashua, where he has been employed for 28 years. He received his Novice license in 1976, his Technician in 1977, and upgraded to Extra in 1983. His primary activities include low-band CW, 2m FM, 220 FM, Field Day, and amateur radio/personal computer interfacing. Bill has been a member of the Nashua Area Radio Club for six years, serving as its president for three of those years. He has been appointed by the ARRL as Public Information Officer for NH and Assistant Director for New England for 1983, and he is a delegate to the NH Amateur Radio Association. Other activities include work on the NH March of Dimes and Nashua Red Cross Executive Boards and participation in Scottish Societies in New Hampshire and Vermont.

KO2X

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Interest in the space shuttle started mounting early in the spring when it became public knowledge we were about to send a *ham* into space. I never dreamed I would be fortunate enough to hear him, never mind call him. October 28 drew closer and every ham was spreading the word.

Our local club, the Tompkins County Amateur Radio Club, decided to get permission to set up a station on the Ithaca Commons, the downtown Ithaca pedestrian mall. Arrangements were completed for the October 28 lift-off. When the lift-off was postponed until November 28, our plans had to be dropped. The space was not available and we lacked ham power due to prior commitments, holiday time, and the fact that we could not arrange for a suitable location. I was ready to forget the whole project.

Monday, November 2: A few of the local hams were discussing the possibility of following through with our plans to have a station set up. We were in the middle of holding our Monday night Novice class and I had very strong feelings about the interest the project would create among the students. One of our newer younger members, Scott KA2AFN, volunteered to build a turnstile antenna. Needless to say, I grabbed at the offer. Scott met with all kinds of problems trying to get together the needed parts for our antenna.

Sunday, November 27: I was fortunate enough to have been chosen to work with other hams in the US in conjunction with Jack Burnett, Executive Editor of *73*. I was included in the first telephone conference call regarding our ham in space. My OM recorded the call on his reel to reel. It was a darn good idea, as I would have been at a complete loss without the information that was recorded. All I could think of was the fact that lift-off was tomorrow and I still lacked a circularly-polarized antenna.

Monday, November 28: The sun rose, the *Columbia* was off on schedule, and I became more frustrated by the hour. So the week progressed. By Thursday, December 1, I was completely oblivious of anything except the antenna. I called on 2 meters and the phone trying to get everything in order for this area's first chance to hear W5LFL.

Friday, December 2: This afternoon, about 5:10 EST, Scott arrived at my house, antenna in hand. We immediately went to work setting it up. At 5:45 pm, we were both out back, taking down the mast and my OM's CB antenna. It was about 25 degrees with winds about 15 mph and pitch black out there. We had a schedule to meet and we were determined to do it. We braved the elements and, finally, at 5:55 pm, into the house we ran, ignoring our frozen ears and fingers. We immediately checked the swr with a meter another club member, Lew KC2YF, had been kind enough to drop off at Scott's work QTH. Lo and behold . . . 1:1. What a fantastic job Scott had done. Scott had another commitment and was only able to stay around for a few minutes. I felt very badly, especially after all the work he had done. After Scott left, I sat with my ear glued to my rig, an Azden 2000 mobile unit. I was sure I had a very faint copy on W5LFL, but there was barely any audio. Later that evening when I was rag-chewing on the club's repeater, the guys convinced me it was other hams calling on W5LFL's frequency.

Saturday, December 3: I heard nothing. I went to bed feeling a little depressed, frustrated, and very disappointed.

Sunday, December 4: Bearing in mind what my Elmer used to preach to me—that a true ham never gives up—I turned the rig on as I was getting ready for church. W5LFL was calling "CQ North America." I was so shocked I couldn't move, and I didn't answer his call. That night, Jack Burnett arranged another conference call with the same group of hams. He gave the group all the latest and most updated information he could gather. When I finished on the call, I felt like I had been given a tremendous shot of confidence and encouragement—go get W5LFL! I spent most of the night planning my strategy.

Monday, December 5: Bright-eyed and bushy-tailed, I went into my shack, confident that not only was I going to hear W5LFL, but also that I was going to work him. I sat by my rig, tension building, excitement mounting, and completely confident of achieving my goal. Suddenly, "This is W5LFL, CQ North America." I grabbed the mike (dropped it), tried to turn the recorder on (couldn't remember how)—I was in a complete state of shock. Luckily, this mass state of confusion lasted just seconds, because I found myself calling him. In the interim, somehow I had turned the recorder on. I know it really

Wanda Lovejoy K2OX

couldn't have been my doing—it must have been my guardian angel. Within a few minutes, W5LFL was calling "CQ" again. It seemed to me that the only ham he was really talking to was me. I went back to him again. It was too far into the game for me to start acting as if I had any common sense at all, because I didn't. The thought never entered my mind(?) to wait for the full length of the window. My OM was still asleep and I ran in the bedroom screaming. Waking him from a sound sleep, he wasn't sure whether I had completely flipped or I had come close to electrocuting myself. He calmed me down, brought me back to Earth, and attempted to explain that the astronaut was really talking to all hams on the continent, but nobody was going to burst my bubble! From here on, my rig was not turned off as long as Owen was on board the *Columbia*. We set a bed up in the shack in case any unannounced transmissions were made. Please believe me, I concentrated so hard on working Owen (you've probably noticed Owen and I are on a first-name basis now) that I never got a chance to work W5RRR. Oh well, they will be at it again many times, but nobody will ever be able to do a repeat performance of what Owen Garriott accomplished.

Tuesday and Wednesday were both fun days, as several opportunities were available to work the *Columbia* again. I worked every chance I got and will never regret one minute of it.

Thursday, December 8: The *Columbia* comes home today. I still am trying to work Owen with the same enthusiasm and pleasure I have felt all week. I feel sure that when I see the *Columbia* touch down, tears will be shed and I will have a feeling of sadness because another friend via ham radio with whom we have shared a good deal of time is back home and getting ready to get back into his normal routine.

I am sure we'll have other hams in space—we know there will be many more space shuttles. We also know that NASA will continue its efforts giving us all still another reason to be proud we are Americans. But all of this will never be able to help us relive the most exciting history-making event shared by hundreds of thousands of hams worldwide which was made possible by one of our own, Owen Garriott W5LFL. I have never been as proud of anything as I am to have had the opportunity to play my small part in this chapter of amateur-radio history.

Thank you and God Bless You, Owen Garriott.

My sincere thanks to Jack Burnett and *73* for giving me this wonderful once-in-a-lifetime opportunity.

Wanda Lovejoy lives in Lansing, New York, with her OM, Gerry, not a ham but responsible for her being one. He urged her to try for her Novice license and then kept pushing her. She was first licensed in November, 1980, upgraded to General in March, 1981, to Advanced in April, and finally to Extra in June of 1981. She is 56 years old and retired from the New York Telephone Company. During the summer she enjoys their cottage on Cayuga Lake, fishing, swimming, and keeping the company of their four children and twelve grandchildren. She is the organist at Our Lady of the Lake Church in King Ferry, about seven miles north of her home. The only real hobby she has is ham radio. She is currently president of the Tompkins County Amateur Radio Club, which just finished its first Novice class—"we have 23 new Novices in the area from a class of 26." Since the final test on December 5, after checking the results, Wanda feels twelve feet tall. "It's such a pleasure to see people work so hard to accomplish their goal for the pleasure and satisfaction we all get from our hobby—ham radio."

N4UF

Billy F. Williams, Jr. N4UF
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It started here in Jacksonville, Florida, during late September when plans were made to publicize the STS-9 amateur-radio operation. Rudy Hubbard WA4PUP of Milton and I began the task with apprehension because of the lack of a precedent on which to base decisions. Rudy is Public Information Officer and I am Section Manager of the Northern Florida ARRL section which includes 44 of the state's 67 counties. Rudy has four Public Information Assistants (PIAs) who work with him.

We elected to start out "blitz" on October 1 in preparation for the proposed October 28 launch date. Packets of information were sent to the PIAs and media contacts which Rudy arranged. We were dealing with several unknowns. Would the signals from the STS-9 be audible? Would most hams brush the oppor-

Billy F. Williams, Jr. N4UF

The Florida Times-Union

Jacksonville, Monday, December 5, 1983

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Ham operator finds lucky number is 96

By Ford Risley
Staff Writer

John Moore's lucky number yesterday turned out to be 96.

Moore, a ham radio operator from Orange Park, talked with mission specialist Owen Garriott as the space shuttle Columbia was on its 96th orbit around Earth.

"It was quite a thrill because so many ham radio operators are trying to make contact," said Moore, a radio ham for almost 30 years.

Moore said as far as he knows, he is the first ham radio operator in the Jacksonville area and one of only four in the state to make contact with Columbia.

Garriott, who is an amateur-radio enthusiast, has taken a five-watt, battery-operated radio into space as part of his personal effects.

When he has time off from his duties on the Columbia, Garriott is holding his radio to a window when the shuttle is pointed toward earth.

Garriott then scans 10 radio frequencies. When the astronaut picks up signals from earth-bound operators, he replies with his call letters — W5LFL.

Moore, whose call letters are W5HUQ, made contact with Columbia at 8:34 a.m. yesterday — on his first try.

"I was very lucky," he said.

Besides good fortune, Moore credits his success to knowing precisely where the Columbia was going in its travels.

He said he got a computer printout with the space shuttle's exact orbits from NASA.

Moore, 44, said he made contact with Garriott as Columbia was over the southwest tip of Florida at an altitude of about 135 miles.

For Moore — who has talked with radio operators as far away as Japan and Russia — the challenge was not distance, but trying to get through while hundreds of other hams were trying to do the same.

Another problem is time.

The space shuttle is over the United States for eight to 10 minutes at a time. And Garriott will only be receiving signals for five or six days of the nine-day mission.

tunity off as too technical? What if we got the media excited and then found we couldn't deliver? These were among the questions which caused much concern.

In Jacksonville, interest in STS-9 was minimal but starting to develop. A few local hams were designing special antennas and a couple even ordered special arrays from commercial sources. The word was spread at our two large ham clubs and on the nets. Just as momentum was gaining, reports began surfacing that predicted certain delay of the launch. A couple of days later, these were confirmed and the earliest possible launch was set for November 28. A possibility existed that the mission would not be launched until February, 1984. Interest seemed to evaporate.

It turned out that the delay was beneficial and provided an ideal follow-up to one of the biggest amateur-radio events ever. On October 25, I heard reports of amateur radio being used by a medical student at St. Georges in Grenada to provide the only information out of a potentially explosive situation. Upon arriving at my job location, a community college with an amateur-radio station, I found KA2ORK/J3 on 20 meters. By noon, calls were coming in from local TV and radio stations. At 1:00 pm, the first camera crew arrived and began taping Mark's transmissions and asking questions about amateur radio. Grenada was instrumental in capturing attention and focusing the media's interest on amateur radio. STS-9 was to be an ideal follow-up a month later. As the reporters left with their stories and tapes, I reminded them about Dr. Garriott's STS-9 operation.

Around 4:00 am on Thanksgiving, November 24, I was tuning across the AM radio dial when I happened upon a station carrying the ABC Talkradio Network. The regular host of the program, I learned, is an amateur-radio operator. His name is Ray Briene N6FFT and he was interviewing Jay Holladay W6EJJ. The topic of discussion was amateur radio and STS-9. It was very enlightening. Many telephone calls were aired from hams around the US. Not being very familiar with satellite communications, the program helped me immensely and my interest in attempting contact with W5LFL increased.

The next day I was tuning my HF antennas for the CQ Worldwide CW contest and also installing a couple of VHF antennas. One was a Ringo Ranger at 70 feet and the other an 11-element Cushcraft beam at 25 feet. It would be odd to me later to discover that height means very little when communicating with a satellite. After completing the work, I began operating the 48-hour DX contest. Although band conditions on HF were atrocious, I did get several new band-countries.

On Sunday morning during the contest, I received a call from the local NBC TV affiliate seeking information on STS-9 which was to be launched the next day. The reporter seemed very interested and was slightly disappointed to learn that no communication be-

tween the shuttle and amateur-radio operators was scheduled until at least Wednesday. He agreed to check back with me on Tuesday. At precisely 11:00 am on Monday, November 28, STS-9 was launched. At 11:04 am, CBS television mentioned Dr. Garriott's ham radio and added that he said "73" and signed his call on the main system nine minutes before lift-off. Upon arriving home at 3:00 pm, I monitored W5RRR at the Johnson Space Center in Houston. Much confusion existed about the orbit times and which ones would be best for amateur-radio contact with W5LFL. Fortunately, the night before I had gotten the latest information from Jack Burnett, Executive Editor of *73* magazine. The ARRL sent out a list of elapsed times which I got on Saturday and my conversation with Jack gave me a couple of new ones which were not on the list. On the whole, I would rate the quality of information from both sources as very good.

I converted the elapsed-time listings into local EST for the 12 most likely orbits. I had doubts about the central USA possibilities but listed them anyway. The next step was to install my cassette tape recorder into the audio line of my 2-meter transceiver which is a Kenwood TR-7800. This was easily accomplished. I had heard that the KA4GXZ repeater in Clermont was planning to rebroadcast the shuttle/ground communications, so I tuned the rig to 145.39 MHz. Since Clermont is over 100 miles from Jacksonville, I didn't expect to hear much. Surprisingly, KA4GXZ/R was putting in a strong signal and this was the case during the whole operation. I learned that KA4GXZ had the machine linked to a similar operation on the Merritt Island repeater and that the K4DPZ/R Gainesville repeater was also tied in. These repeater operators are to be commended for their initiative in providing shuttle-to-ground audio. Anyone who monitored the shuttle transmissions on KA4GXZ/R is asked to send a card or note to the *Callbook* QTH so that owners Wayne Fletcher and John Mullan W4OQF can gauge interest for future launches. Those hearing the rebroadcast on other repeaters should drop notes to those responsible as well.

On November 28, the *Jacksonville Journal*, an afternoon daily, carried a front-page article and photo about Hank Fitz WB4URU and his preparations to work W5LFL. Hank is an experimenter extraordinaire and did an excellent job of getting the information across to the reporter—a task not to be taken lightly. The same day, I received a copy of an article from a Sanford newspaper which had been carried a few days earlier. Wimpy Wimberly KB4LB was featured along with a photo of him at his station. Wimpy is one of our most energetic Public Information Assistants who covers the Greater Orlando area.

Other than listening to the shuttle audio through KA4GXZ/R, there was really little else to do except to try to gauge the interest while answering an occasional telephone call from the media. The local TV and press gave the impression that they expected a mass contact operation by W5LFL, but I had serious doubts. His signal would be audible for only eight minutes at a time which would give a total of 96 minutes of operating time if all 12 passes were perfect. I estimated he might make 500 contacts at most during the eastern and central US passes. It was decided to start impressing this point upon the media. On Tuesday, I got a call from the NBC TV affiliate again and it was agreed they would send their news team to my home for the first of the 12 possibilities which would be orbit 34. I quoted the odds at 100 to 1 against a contact and 5 to 1 against hearing W5LFL. This was to be a low orbit and would pass about 1,000 miles west of Jacksonville. In retrospect, the 100 to 1 odds seem very conservative!

On Monday night, the local ABC television affiliate had some shots of Robbie Roberts KH6FMD/W4 preparing for the chase. They stopped by Robbie's house on the way back from Cape Canaveral.

Throughout Monday and Tuesday, I monitored area two-meter repeaters to get some idea of the extent of local efforts to contact STS-9. The biggest problem was confusion as to which lists and times were correct. Quite a few hams were using outdated lists, and while about 50% of those surveyed wanted to make an effort, only a handful had the correct times. Jacksonville Public Information Assistant Mike Reublin NF4L and I participated in a discussion on the 146.16/.76 repeater in which we disseminated the correct information from the data supplied by the ARRL and *73*.

As I tuned across two meters on Tuesday, I heard quite a variety in antennas to be used. Four-bay dipoles and 11-element beams seemed to be the most popular choices. Typical power levels were in the 100- to 200-Watt range with three stations contemplating the legal limit. My own 25 Watts seemed small, but I reasoned that it was more luck involved than station capability. I was to learn a lesson in that regard, though.

My day for Wednesday, November 30, was planned. I would go to work about 8:00 am, teach my morning electronics classes, and be home for lunch by 11:15 am. The NBC TV affiliate was to arrive at 11:30 am and we would tape the orbit 34 pass from 12:10 to 12:25 pm for broadcast on the evening news. Just as I was leaving work for lunch, I got a call from another TV station. The CBS affiliate wanted to send its live remote truck to my house. I explained the odds again and informed them that one station had already asked to be present but that any station was welcome to attend. They said the truck was on the way.

Arriving home, I heard the telephone ringing. The ABC affiliate also wanted to send out a crew. After again explaining the odds of contact, I invited them to attend as well. By 11:50 am, all three TV stations had their equipment in place and checked out. One station, the CBS affiliate, would be broadcasting live during the middle segment of the noon newscast. The others would be taping for 6:00 and 11:00 pm.

I figured that W5LFL would be audible from about 12:15 to 12:23. At 12:05, I began scanning the 10 frequencies and monitoring 145.55 MHz. The live report started and I made a 20-second call which was, of course, unanswered. I then was posed a couple of questions and stated that I hoped to be the lucky one to contact W5LFL despite the long odds. A similar stance was taken with the other reporters who taped interviews after the live report was over. I was trying to develop the angle of who would be the local lucky ham to make it through to STS-9. There was little to show so far. Even a little reception of W5LFL would have been helpful. Any ideas of a DXpedition-type operation were doused and the question was now "can a local ham make good?" Any local ham would suffice. The worst thing would be to have no local get through.

Fortunately, I tuned the HF rig to 14.280 MHz where W5RRR was operational. The reporters were still listening and we heard a loud pileup of stations calling to report that no one had heard W5LFL. There must have been 75 or 80 stations. That experience reinforced the angle of whether any local ham would be successful. If so, it should be a big news event. Later, we found out that Dr. Garriott was occupied with other duties. Incidentally, the idea of the tape recorder aboard the spacecraft was a very wise one. It took pressure off those who were involved with the media. We always could say we were confident that we would be on the tape but that no one would know until the mission was completed. This took the edge off of the unsuccessful attempts conducted in the presence of the media. The end result was a failure being turned into a selling point. As they left, the reporters gave me special numbers to call if any local station got through. I also promised to tape any interesting events.

The second of the 12 opportunities came on orbit 39 which was from 8:05 to 8:15 pm Wednesday evening. Again, this was to be a central US pass but the orbit was to be of higher altitude which would extend the communications corridor to include us on the fringes. Our weekly ARES net met at 7:30 pm on 2 meters and I read the schedule as a QNC. All 3 local affiliates carried the story on the 6:00 pm news along with pictures taken at my house that noon. Few locals had attempted on orbit 34, but interest in orbit 39 was much more intense. I decided to do most of my calls on 145.03 MHz. Some stations were using the "shotgun" approach with short calls spread over the 10 uplink channels. I spent about 30% of the time calling with the other time spent scanning the uplinks with my priority set on 145.55 MHz. I planned to make a tape of those calling to be edited and played at a future local ham club meeting.

There was no reception from W5LFL on orbit 39, so it would be the next morning (Thursday) before we would have our third shot in Jacksonville. Orbit 49 was scheduled for 10:27–10:47 am which would be a prime opportunity since it was the first east-coast pass on the list. Fortunately, I was able to get home long enough between classes to give it a shot. However, the astronauts were holding a live press conference at that exact time so our only hope was the tape recorder which might have been running. Some discouragement was being noted locally. We had been foiled on our first three attempts. Some had heard rumors of a Montana station making contact Wednesday night and other reports of very strong reception on the west coast had been noted. But locally, we were batting .000 being 0 for 3.

Friday evening provided the next opportunity. Orbit 70 was listed for 6:05–6:25 pm over the eastern USA, followed 90 minutes later by orbit 71 over central USA. Despite some frustration, more locals than ever were planning to give it a try. Both orbits passed without success. One local reported working W5LFL but I was suspicious of the claim. The source of information being second or third hand was very unreliable, and although I would have liked to get a story on the air, the potential for embarrassment was too much. I was later to find out that contact at the time stated was impossible. No one else locally had heard even a peep on either orbit.

Saturday was a breather with no scheduled orbits of operation in our area. My finances were looking up after the Thursday night televised pro football game which made me very happy. And they were to be even better still as a result of the nationally televised Florida Gator/Florida State Seminole football game. Looked like the Gators and the Raiders were having

much better luck than the local ham-radio operators.

Scattered blind calls were heard throughout Saturday evening. I even made a couple myself hoping for a break. Maybe Dr. Garriott would have a few unscheduled minutes and I would luck out. Maybe similar to a DX contest situation where thousands of stations are embroiled in a pileup and one ham moves up the band and hears an even rarer station calling CQ with no takers. At least I had plenty of local hams on tape for the meeting program. I had no way of knowing at the time, but Sunday was to be a very big day!

8:00 am Sunday arrived sooner than expected and it was time to stumble around getting ready for orbit 96. As the *Florida Times-Union* was to say in the next day's edition, 96 would be a ham's lucky number. It was tempting just to forget it and go back to sleep since we had been unsuccessful in even hearing W5LFL, but that idea didn't last long. After all, this pass was to be very close and our luck had to change.

At 8:35 am I heard W5LFL in a clear crisp signal! "I am still not able to read many of the signals in my headphones here because the background noise is just too high. We will have it all on tape and be able to sort it out when we get back on the ground. So this is W5LFL in the spacecraft *Columbia* now approaching the—let's see—we are coming across the Gulf at this time approaching the coast of Florida and then on up the east coast. W5LFL is calling CQ North America and I'll be standing by for the next 60 seconds."

A tremendous pileup ensued! A minute later we heard "W5LFL returning to Kilowatt Four Germany Foxtrot Germany. Your signals are loud and clear. Also a Kilowatt Victor Four Charlie . . ."

I looked up K4GFG in the *Callbook* and found he was licensed to Davie, Florida, near Miami. Also Dick Jansson WD4FAB of Orlando was recognized. And most important for Jax area hams, John Moore W5HUQ was logged by W5LFL! Actually, John had worked him just as he came up over the horizon. We had a local ham in contact with STS-9! A couple of minutes later, the telephone rang and John asked if I heard it. Indeed I had and the signal quality of W5LFL was sensational. Within the hour, a TV news team from the local ABC affiliate was en route to John's Orange Park QTH. They taped a very nice report which was aired on the 6:00 pm newscast. To make it even better, W5LFL had also contacted King Hussein JY1 and of course that was big news. It was a natural local tie-in!

Meanwhile, a similar scene was unfolding in Orlando where WD4FAB was also featured and gained much publicity for amateur radio. Only four Florida stations were to be logged during the regularly publicized orbits and I felt lucky to have one of them in the Jacksonville area and another in Orlando which is in the Northern Florida Section.

Orbit 96 faded away with 97 due in about 85 minutes. The next pass was to be over the central US and I doubted whether it would be heard in Jacksonville. But there was nothing else to do but give it a try. At 10:07 am, I was surprised to hear, "This is W 5 Lima Foxtrot Lima in the spacecraft *Columbia* calling CQ North America . . ." He went on to say he was over Texas. Signal quality was still excellent! A local ham, Bernie Munsey N4GBY, later reported hearing W5LFL very clearly on his mobile unit as he was heading south down Interstate 75 in southern Georgia. He was using only a 5/8-wavelength whip antenna.

At 9:07 pm that evening, I participated in a conference call with other hams who were writing reports for this article series. *73*'s Executive Editor Jack Burnett filled us in on the latest information and Bill Pasternak WA6ITF gave us insight with his observations. Each participant then gave a capsule version of activity in his or her area and a tape of a west-coast pass was played. It was a pleasure to be able to participate.

Next up was orbit 112, scheduled for 8:15-8:23 am on Monday. Again luck was with us. Although not as clear as the day before, W5LFL was heard with much the same announcement. The background noise was very high and the tape would tell the tale. W5LFL was not heard on orbit 113.

On the way back to classes, I picked up the morning paper and on the front page was a story headline: "Ham operator finds lucky number is 96." Of course, the article featured John Moore W5HUQ who did an excellent job of getting the information over to the reporters. Besides being lucky, John credited his success to knowing precisely where *Columbia* was going in its travels. He had a computer printout with the exact orbits from NASA. John's station included a pair of 7-element beams and a kilowatt. He has been very active with OSCAR and VHF, having all states worked on 6 meters along with 63 DXCC countries on 432 MHz where he operates EME. His rig is a Kenwood TS-700A.

Dick Jansson WD4FAB is also very active on VHF. He has served two terms on the ARRL VHF-UHF Advisory Committee (being the only fourth call area member). It was revealing to note that the stations

breaking through the tremendous background noise were top-notch operations while the simpler stations had great success in receiving W5LFL. I guess there is a message in that somewhere.

Orbit 129 on Tuesday was the next shot but was not heard by me or John. No dice either on 133 that afternoon. The last orbit on the regular schedule was 134 on Tuesday from 5:25-5:35 pm which was to be a central US pass. I heard two transmissions from W5LFL while he was over the Mississippi Valley carrying on a QSO with a station out that way. John Moore W5HUQ picked him up for 5 or 6 exchanges beginning with STS-9 crossing the snow line. John reported that KB4CRT in Tampa had contacted W5LFL, making him the fourth station in our state to do so.

Later Tuesday evening, I received a call from the news director of a very popular FM radio station. I played my tapes of W5LFL over the phone to him along with a sampling of the bedlam of the pileup. These were featured during morning drive time the next day. This was a good ending to a great event!

The only thing left to do was to try to work STS-9 on an unscheduled orbit during the last two days. Unfortunately, my class schedule had caught up with me and I didn't have as much time as I wanted, but scuttlebutt on the bands indicated orbits 150 and 151 on Wednesday might be a good bet. No luck here, but it was fun trying.

At this time, I cannot say which event was bigger, STS-9 or Grenada. I measure the significance of events by their long-term effect. One thing is for sure: The period of October 25-December 8, 1983, generated the most positive publicity for amateur radio that I can ever remember! I have been licensed since 1964 and have files of the 3 major ham publications going back to 1948. Nothing can match this 45-day period we just experienced! Another interesting point is that I never heard amateur radio referred to as CB once during all the publicity. At our college library are newspapers from many major cities and it is a pleasure to see big articles on amateur-radio operations in most of them.

The publicity generated by Grenada and STS-9 comes at a crucial time. We live in a political environment where the quiet get trampled. The FCC is insulting us with one proposal after another. I think they would like to drop amateur-radio licensing altogether and what we are seeing are token efforts. We must maintain high standards and become involved in promoting amateur radio or we may follow CB into complete deregulation. *73* is to be thanked for its promotion of this documentary. I have enjoyed working with Jack Burnett and the other hams involved.

Billy Williams N4UF is a professor of electronics at Florida Junior College. Now an Extra, he was first licensed in 1964. He has served as president of such organizations as the North Florida Amateur Radio Society, the Jacksonville RANGE Repeater Association, and the North Florida DX Association. He also is Section Manager of the Northern Florida Section of the ARRL and DX Awards Manager of CQ magazine.

KA4AKO

Robert C. Holley KA4AKO
PO Box 341
6184 East Ponce de Leon Avenue
Stone Mountain GA 30086

I kept a diary from Monday, November 28, through Thursday, December 8.

Monday, November 28: This station called *Columbia* W5LFL on 2 orbits. No reply was received from Owen Garriott on either try.

Tuesday, November 29: Mark Durfield KB4BPL, 15-year-old sophomore from Redan High School in DeKalb County, asked me to pick him up at his school during a study-hall period. With permission from his parents and the school, I transported him to his home amateur-radio station where he and I both made calls to *Columbia*. This was done 10:28 through 10:35 am. No reply received.

Wednesday-Saturday, November 30-December 3: Attempts were made on all eastern orbits to contact *Columbia*.

Sunday, December 4: Charles Griffin WB4UVF (Clarkston, Georgia) was monitoring 145.55 and he heard and taped W5LFL acknowledging K4GFG and another K call on orbit 96A.

Sunday, December 4: At 5:55 pm EST, Jim Truluck KB4A (Griffin, Georgia) reported to me via 2 meters that he had a good visual sighting of spacecraft *Columbia*.

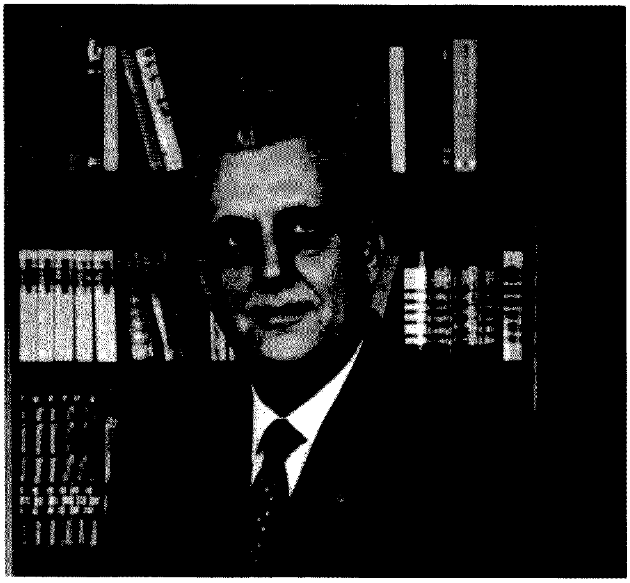
Monday, December 5: At 8:28 am, this station heard W5LFL sign on with "This is W5LFL calling CQ America. I am ready to receive calls." Signal report from my mobile rig, a Yaesu 227R, ¼-wave magnetic-mount Larsen antenna; on an rf signal meter, 0 to 10, I received a 4.

Tuesday, Wednesday, and Thursday, December 6, 7, 8: No other contacts received from *Columbia*. KA4AKO continued to place calls each time the spacecraft passed over the Atlanta-Stone Mountain area. K4LDR, Atlanta, was contacted on 145.41, the club repeater. This group carried on excellent coverage on the space-shuttle operation, and I asked Pete to furnish me with all available data that his

group collected during the period that the craft was in flight. He has been very helpful in furnishing the diary of his and other stations.

This has been a great opportunity to work a special event and I appreciate being chosen and included to participate.

Robert C. Holley KA4AKO is 59 years old. He served in the US Navy during WWII and the Korean conflict. He was Post Office Clerk 15 years and Postmaster, Stone Mountain GA 30086, for 16 years. He holds a Technician license and has been an amateur since May, 1978. A member of the ARRL, Alford Memorial Radio Club, Atlanta Radio Club, and the West Central Georgia Repeater Association, his station consists of an Icom 25A transceiver, two Yaesu 227R transceivers, an Icom 215 2-meter transceiver, and two Tempo S-1 2-meter transceivers. He has two Whamo 10 scanners with two digital frequency selectors and a Regency M-100 scanner. His fixed-station antennna is a Ringo Ranger up 40 feet above ground.



Robert G. Holley KA4AKO

K4LDR

P. J. F. Shaw K4LDR
268 Braden Drive
Tucker GA 30084

Following the launch of W5LFL aboard STS-9, the Metro Atlanta Telephone Pioneer Amateur Radio Club (MATPARC) began receiving computer-generated orbital data from Clark N5XX, Fish WA4HXE, Doug K4SWJ, and Stan WA4DYD. All data was rebroadcast via the MATPARC VHF repeater (W4PME/R 144.81/145.41) for the Atlanta area amateurs. Broadcasts were each hour, then every ten minutes during the one hour prior to the upcoming orbital communications opportunity.

Following each orbital opportunity, Pete K4LDR conducted a forum on the repeater where each participant shared his observations, thoughts, thrills, and experiences. K4LDI and WD4KYO were assistant net-control stations. WD4KYO copied ARRL teletype bulletins and passed them along. For those who did not receive signals from W5LFL on a particular obital pass, recorder tapes were played for their benefit.

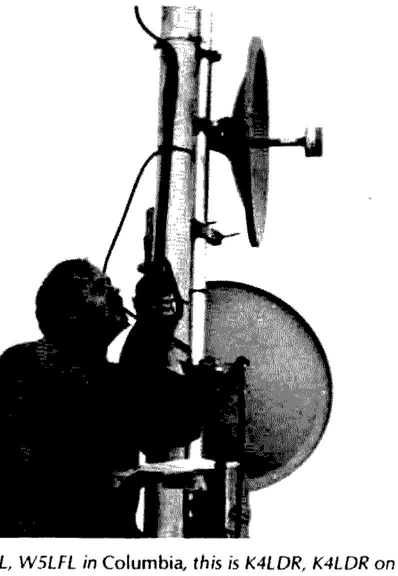
As the word of our endeavors spread, the MATPARC repeater system enjoyed more than 100 different amateurs participating, with 30 to 50 per net session. Stations from Alabama (Gadsden—90 miles distant), South Carolina (Laurens—140 miles), and all over north and central Georgia checked in, either asking for or providing information. Also participating were several handicapped amateurs that our group was pleased to have join us. It was clear that our MATPARC repeater exceeded the coverage we had calculated.

AK5Q, mobiling through Atlanta, heard and joined us. When he reached his home in Tennessee, he was unable to learn orbital information locally (he was a brand-new resident). He telephoned K4LDR on successive evenings to receive the 21.00 MATPARC Bulletin which forecasted orbital data for the following day. Also checking in was NK4E/aeronautical mobile. MATPARC was pleased to make so many friends that we didn't know we had.

For orbital passes during working hours, W4QO, WD4KYO, W4PME, K4LDI, WB4LFY, K4LDR, KA4SBD, and WB4IRR, with non-licensed interested guests, ascended to the roof of the Southern Bell Corporate Headquarters building (650' AGL/1650' AMSL) in hopes of hearing W5LFL (or being heard) with handie-talkies. Early morning trips to the breezy roof found ice, 35° F, and a windchill of 15° F.

At least one non-active amateur, K4LAR, who heard W5LFL on a scanner, was re-enthused and hastily arranged for a transceiver so that he could receive better and make calls also. Dick reported into our net absolutely overjoyed that he heard W5LFL; he is back into ham radio. Though handicapped and in a wheelchair, Dick assembled a Ranger II antenna and is ready to put it in the sky, with some assistance.

Dr. Garriott acknowledged two W4-area callsigns as he traversed Atlanta during orbit 144: WA4BEV and WA4EWA. Ken W4OCW telephoned WA4BEV in Valdosta, Georgia (230 miles south), but was unable to reach WA4EWA in Birmingham. Ken played his off-the-air tape for WA4BEV. BEV was absolutely ecstatic and thanked Ken six ways to Sunday. Ken was gracious and mailed BEV a copy of the tape segment.



"Calling W5LFL, W5LFL in Columbia*, this is K4LDR, K4LDR on Earth, over." (Photo by Bob WD4KYO)*

To date (12/9/83), none of the Atlanta area amateurs knows if he is part of W5LFL's log (tapes), but we all have hopes! Over seventy local amateurs participating in MATPARC net sessions received W5LFL transmissions. Many had tape recordings; all were thrilled and excited. K4LDR remarked that he is requesting an SWL card, for sure, and that the 2-cent confirmation card would deserve an $8.00 frame. All acknowledge that "this is the best thing that has happened in amateur radio since the first functioning OSCAR satellite obtained orbit."

Thanks to W5LFL, NASA, AMSAT, the ARRL—and all the behind-the-scenes people and . . . amateur radio!

KD5JO

Bob Buchanan KD5JO
9632 Vista Oaks Drive
Dallas TX 75243

I want to start my report by saying it was an exciting experience to monitor, listen, and transmit to astronaut Owen Garriott W5LFL as the shuttle *Columbia* passed over the Dallas area. The most frustrating part of the entire experience was the amateur-radio operators who constantly called on the downlink frequency of 144.550 MHz and made it virtually impossible to hear any signals from the spacecraft. This situation improved greatly with the passage of time.

It was a "golden time" for all of amateur radio and we were well recognized by numerous newspaper articles as well as coverage on TV and radio. I was not contacted by anyone from the media; the local coverage was of a general nature.

As soon as word got around that I was doing a diary-type report for *73* magazine, I had some great support from many local ham-radio operators. I want to recognize, in particular, Al Brinkerhoff WB5PMR (Dallas), the north Texas area coordinator for AMSAT, who shared with me a great deal of data which he took off his computer and made it possible for me to have very accurate data concerning the window when the spacecraft was close to the Dallas area. I also received a great deal of valuable information from Fred Maia W5YI, publisher of the *W5YI Report*. Now I would like to pass along to you the notes I made in my diary during the flight of *Columbia*.

Wednesday, November 30, Orbit 34A: This was the first pass over the central part of the United States. The Texas window was 11:14–11:21 am local time. The *Columbia* passed over the El Paso area, and no one in the Dallas area reported

hearing Owen Garriott. Many amateurs were transmitting on the downlink of 145.550, which made it virtually impossible to hear any calls that may have come from the spacecraft. I was operating a Yaesu 227R transceiver (10 Watts) and using a Ringo Ranger antenna up about 20 feet.

Wednesday, November 30, Orbit 39D: This was rumored to be one of the best orbits over the Dallas area, with the spacecraft reported to be just 100 miles away from us. Window time was 7:04-7:12 pm. No one in the Dallas metroplex area reported hearing the spacecraft on this orbit. We later heard that orbits 34A and 39D were scrubbed due to schedule changes that were necessary aboard the *Columbia*.

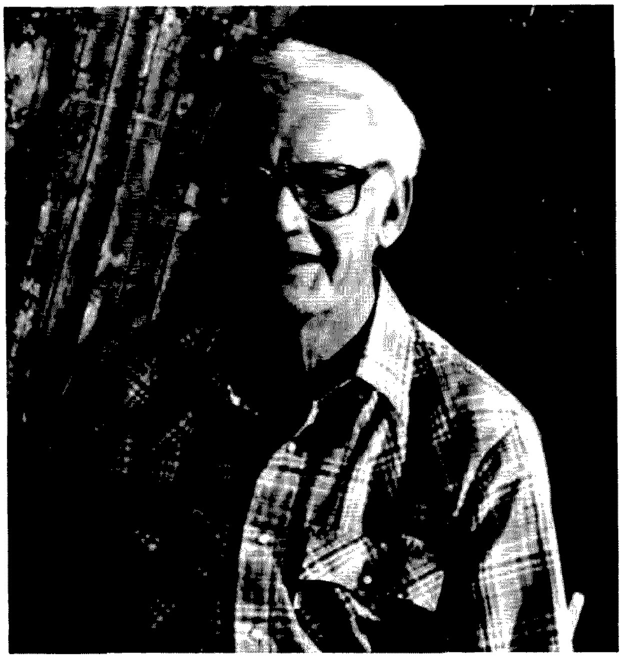
Thursday, December 1, Orbit 49A: The window time on this pass over was 9:33 to 9:41 am, and I listened to it in the car using an Icom 2AT with a 10-Watt amplifier. Did not hear any signals from the spacecraft.

Friday, December 2, Orbit 71D: This was a great day for KD5JO! I heard W5LFL for the first time at 6:48 pm. Owen was loud and clear, and he called CQ and said he would be listening for 70 seconds. He came back and started to repeat some of the calls, but QRM absolutely wiped him out! We did hear him say he would be listening for the next 90 seconds, and we transmitted again as we did during the 70-second period. No further word came from the spacecraft. My wife, Nancy, was in the ham shack with me during this orbit, and she was thrilled to hear the voice of Owen Garriott.

Sunday, December 4, Orbit 97A: The window on this orbit was 9:01 to 9:09 am and it was reported that *Columbia* was 100 miles east of Dallas. I heard W5LFL loud and clear at 9:06 CST, at which time he reported that his headset was not working well but that calls to the spacecraft were being recorded on tape and would be delivered to the ARRL as soon as *Columbia* completed the mission.

Monday, December 5, Orbit 113A: I listened for W5LFL on this orbit but did not hear him. I learned later that the *Columbia* crew was engaged in a press conference and a discussion with President Reagan at the time they were to be transmitting to the Dallas area. This was unfortunate, since this orbit was reported to be going directly over us at about 8:52 am CST. I also observed that not many stations were monitoring this morning pass; perhaps the interest and excitement level had decreased somewhat.

Tuesday, December 6, Orbit 129A: I heard W5LFL at 8:43 am CST. He said he would be monitoring the uplink frequencies for 90 seconds. His signal was 5-9±. I was in my car at the time using an Icom 2AT at 10 Watts and using a 5/8-wave antenna. Owen Garriott did not report back after his CQ call. The spacecraft was reported to be 100 miles west of Dallas.



Bob Buchanan KD5JO

Tuesday, December 6, Orbit 134D: I listened to this orbit in my car, also. I heard W5LFL at 4:31 pm loud and clear, and he passed about 100 miles to the west of Dallas. He made the comment that he could see the Texas area very clearly and was hoping he would be able to make contact with someone in his hometown. He said he would listen for 1-1/4 minutes for any calls from the area. He did not repeat any calls that he might have heard.

This concludes the entries in my diary. I was not able to monitor any more orbits that may have been scheduled. I want to close by saying I am very proud to have been a member of the team that was selected by *73* magazine to be involved in the flight of *Columbia*. I think we learned a great deal from this experience, and the information gathered should be valuable in future amateur-radio communications between Earth and space. A special thanks to Owen Garriott who took time from his busy schedule to make a great contribution to the entire amateur-radio community.

Bob Buchanan KD5JO is 52 years old, with three sons and two grandchildren. His wife, Nancy KA6ADA, has her Novice ticket which she received when the family lived in Laguna Beach, California. After 28 years of employment with Eastman Kodak, Bob took an early retirement from Sales and Marketing Management this past April. Presently, he is in management with the Primrose Oil Company of Dallas. Bob has been a ham for 25 years, and his other hobbies include fishing and photography.

WB5ASA

E. van der Smissen WB5ASA
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Texas City TX 77591

A book could be written about the experiences of individual hams trying to contact the spacecraft *Columbia* and Owen Garriott W5LFL. Tall tales ("How I Worked W5LFL on 2½ Watts With a Hand-held") and similiar stories will be flying around hamfests until the next ham-in-space mission.

Signals from *Columbia* were strong and rode over the QRM on nearby passes and were even full quieting on some passes that were over the horizon.

W5LFL was heard in Texas on November 30 at 8:35-8:45 pm CST as the *Columbia* was passing over California on orbit 40D. The signals were full quieting in the Houston-Galveston area even though the *Columbia* was 1800 miles away over the horizon. E-skip was helpful in propagating several over-the-horizon signals. Houston-Galveston stations with good beams were able to copy W5LFL on orbit 40 with complete readability and signal strength of S5 to S9. He was also copied full quieting on several hand-helds using rubber-duckie antennas.

Roy Neal K6DUE had his hand-held on the bedside table in his room on the eleventh floor of his hotel in Nassau Bay (across the street from the Johnson Spacecraft Center), and signals from orbit 40 were strong enough to wake him up with a full-quieting signal.

Every type of receiver capable of receiving two-meter FM signals seemed to successfully hear the 5-Watt signal of W5LFL—scanners, hand-helds, and, of course, conventional base stations. During the flight of *Columbia* (STS-9), there was hardly a ham with two-meter FM capability in the Houston-Galveston area who did not at least listen for W5LFL.

If you only heard Owen Garriott on any of the orbits, send your reception report with an SASE to ARRL, STS-9, 225 Main Street, Newington CT 06111. (A reception report should include orbit number, time, your location, W5LFL's comments heard, and a description of your station.)

In spite of Murphy and his laws, hundreds of hams received contact confirmation as *Columbia* passed within range. Thousands more attempted to make contact, and several hundred will receive the WADL award (Worked All Down Links) for repeater offset mode, shifting from 600+ repeaters to the *Columbia* uplink frequencies without changing the offset-placed transmitted signals on the *Columbia* downlink frequencies, thus producing much QRM on W5LFL. More hams were heard on the uplink and downlink frequencies than had ever been heard on two meters before.

It will be interesting to see a profile of the ham stations that were actually heard, or recorded, by W5LFL. Were they all EME stations, or were some even handie-talkies? I understand the NASA club (W5RRR) is planning to develop such a profile report.

Hams tried to get every bit of performance possible from their stations, but for some this was too little, too late. I had circularly-polarized satellite antennas on hand but did not get them mounted in time, so I had only a discone and a turnstile antenna to use to try to make contact.

Rumors were wild about the types of stations used by hams. We heard that one ham in California (where else?) went out and bought ten transmitters, ten amplifiers, and ten antennas, put one on each of the ten uplink frequencies, and used them all simultaneously. I wonder if he ever made a contact.

WA5NOM, one of the first stations in the Houston area to be acknowledged by W5LFL, was operating an Icom 271 driving a 160-Watt amplifier feeding a Cushcraft 20-element twist antenna in an az-el mount as used for satellite work. It was calculated that his effective radiated power was more than 3,000 Watts.

On December 5, one of the Texas City hams (ND5D) worked W5LFL using modulated CW, with 10 Watts to a vertical antenna. The CW was believed to be acknowledged by W5LFL.

Effective radiated power (erp) used in the Houston-Galveston

area ranged from 2½ Watts to over three kilowatts. W5LFL had estimated that 40 Watts erp from a turnstile antenna would be adequate, but I believe he underestimated the QRM on each pass and the power needed to cut through. Stations heard calling W5LFL from the Houston-Galveston area included many 10-Watt stations using simple vertical antennas similar to the Ringo Ranger. Others used various types of beams: horizontally polarized, vertically polarized, or even circularly polarized. Stations used to work the OSCAR satellites seemed most effective.

The most successful antenna systems were circularly-polarized (right- and left-hand switchable) beam antennas on satellite-tracking mounts that could track the shuttle in its orbit. These satellite beams, and also horizontally-polarized beams aimed at the horizon, were able to pick up STS-9 at or slightly before (e.g., minus 3° elevation) it came over the horizon.

For passes below 20° elevation, the vertical-gain antennas (e.g., Ringo Ranger, Isopole, or similar), with their low angle of radiation, had good reception and probably good transmitted signals for most of the pass. Verticals, because of their overhead cone of silence, were not effective on direct overhead passes. However, when the pass was above 20° elevation, the turnstile and horizontal dipoles seemed to have the edge. The discone antenna and rubber duckies were not very effective, but W5LFL was heard on even these antennas.

It was amazing how many stations were actually heard. Two-meter FM simplex around 145.00 MHz, and particularly on the downlink of 145.55, appeared to have much more range than is usually considered possible on FM. (Maybe we have been missing a good many DX possibilities.)

The orbital predictions and information put out by the NASA club (W5RRR) were very helpful in following W5LFL and the *Columbia* for visual sightings as well as radio contacts. Hams all over owe the NASA club and the others involved with the ham-in-space program some very sincere thanks. Already, hams in the Houston-Galveston area are asking themselves, "What will I do different next time?" Some of the ideas that have already come up are:

● Make sure my transmitter is not in the repeater offset mode. Monitor my transmit frequency.

● Aim my beam at the point on the horizon where the shuttle (satellite) is expected to arrive, and start transmitting before it comes over the horizon. (This seems to provide an "edge effect" that enhances the signal at the horizon.)

● Have az-el antenna mounts that can track the shuttle pass.

● Set up switchable circularly-polarized antennas high enough to be above surrounding buildings and trees.

● Run more power. (This is one idea with which I do not agree. I believe we should keep our power down to avoid QRM. If all stations had kept power down to 40-100 Watts erp for STS-9, there would have been less QRM and more contacts with W5LFL.)

● Use vertical-gain antennas for passes below 20° and turnstile antennas for passes above 20°, since I cannot afford (financially or space-wise) a satellite antenna system.

● Try to transmit in clear spots (time-wise, or frequency) on the appropriate uplinks.

● Get some practice working the OSCAR satellites.

I hope you were successful in working Owen Garriott W5LFL on the *Columbia*. If you did not work him this time around, give some consideration to the comments and suggestions in this article and prepare for better luck next time.

WB8IFM

Gerd Schrick WB8IFM
4741 Harlou Drive
Dayton OH 45432

Preparation in Dayton started back in September with a short presentation at the Dayton Amateur Radio Association (DARA) about OSCAR 10 and the space shuttle. In one of the following club meetings, wave polarization was discussed and a home-brew turnstile antenna demonstrated.

I mounted my turnstile, backed by a 4' × 4' screen fixed pointing south and 45° up, and was able to copy OSCAR 10 for many days without changing the position of the antenna. A planned test with an aircraft was not necessary. I have since replaced this simple "cross dipole backed by a screen reflector" with a 2 × 6-el crossed dipole with little if any improvement.

Sunday, 27 November: Time of launch gets close; clean off operating table to make room for the various 2m FM components. A 50-W transistor amplifier is dusted off and pressed into service. We have now the KDK 2015 with 12 W driving the amplifier and the output is 45 W. Good reports are received from several local hams.

Monday, 28 November: Space shuttle got off the ground; clock is

See List of Advertisers on page 114

Gerd Schrick WB8IFM

Sat., Dec. 3, 1983 **DAYTON DAILY NEWS** 23

Radio operator picks up shuttle

Even though it's difficult to see the space shuttle Challenger as it passes the Dayton area, at least one local ham radio operator was able to pick up a transmission from space Friday evening.

Frank Schwab said that at 7:48 p.m. he picked up a transmission from astronaut Owen Garriott, an electronics expert who has been beaming ham radio broadcasts back to Earth.

Schwab said the astronaut repeated the call letters of several ham operators, but he was unable to hear whether his was among them.

"HE SAID HE was going to stand by for the next 90 seconds," Schwab said, as he played a tape recording of the transmission.

The astronaut then said "CQ," which meant he was calling for other operators.

The entire transmission lasted only about three minutes, until the shuttle was out of range, but Schwab said it was a "real thrill."

A ham radio operator for 37 years, Schwab said he probably picked up the transmission because he lives about seven miles north of the city — on Dog Leg Road — and doesn't have buildings or other obstructions.

Friday evening was one of the best times for local operators to receive transmissions from Garriott, who is broadcasting primarily on the frequency 145.55 MHz.

AND THE SHUTTLE will also be in range in the next few days, including Sunday around 10 a.m., Monday and Tuesday between 9:30 and 10 a.m. and Tuesday around 5:30 p.m.

Eye contact with the shuttle is a different story, however, according to a local astronomer.

Residents could get a pretty good look at the craft when it was visible for about four minutes Thursday.

However, cloudiness interfered with sighting Friday and likely will do so again Saturday, said James Reist, curator of astronomy for the Dayton Natural History Museum. Sunday through Tuesday, the Spacelab's orbit and distance may make it difficult to see, Reist said.

REIST SAID the the Spacelab would appear as a moving light in the sky.

The Lewis Research Center reported the following orbits for today through Tuesday:

• Today, 6:03 p.m., moving northwest to south, visible for 4 minutes, 27 seconds. Difficult to see except in extreme northern part of Montgomery County — 39 degrees above the horizon, 243 miles above the earth.

• Sunday, 5:53 p.m., moving west to south, visible for 3 minutes, 51 seconds. Very difficult to see but best chance in extreme western part of the county — 24 degrees above horizon, 347 miles above the earth.

• Monday, 5:43 p.m., moving west to south, visible for 3 minutes, 7 seconds. Very difficult to see but best chance in extreme western part of county — 16 degrees above the horizon, 464 miles above the earth.

• Tuesday, 5:33 p.m. West to southwest, visible for 1 minute, 41 seconds. Very difficult to see but best chance in extreme western part of the county — 11 degrees above horizon, 588 miles above the earth.

ticking. Must not forget to synchronize station clock (electric with second hand) to WWV. Turnstile antenna is "mounted" almost on the ground in our front yard; hope for no vandalism for the next week. A decision is made to use a second radio; an IC-2 is connected and set to Owen's main frequency. Two antenna switches are employed, one to connect either one or the other receiver and one to connect any of three antennas: a vertical dipole at 70', the 2 × 6-el OSCAR antenna (8' above ground), and the turnstile directly on the ground. Now all we have to do is worry about the schedule.

Tuesday, 29 November: Listening on the bands, local repeaters, etc., lots of numbers are exchanged, but no clear picture emerges. The AMSAT Net at 9:00 pm on 3850 is great confusion: lots of decimal points and digits to feed the hungry computers. However, at the end there is some useful data! Now we see the light, getting ready for the first try which will be tomorrow noontime—will be home for lunch at 12:00.

Wednesday, 30 November: Did I mention, we have no computer; we go by orbit period and rotation of the Earth. We have pre-published data and they are very close; still, we plan to be on a few minutes early and stay a few minutes late.

Orbit 34D: No sign of W5LFL, but a lot of local stations are calling during the odd minutes. I count at least seven stations! Next I try orbit 38D—although not scheduled, there may be a chance. But Owen does not show up. Over WA3NAN on 3860 I overhear the shuttle communication and Owen is doing experiments.

Orbit 39D: Another no show of Owen. Lots of locals call, but with the ten available calling frequencies, you can still find a clear spot (locally, mind you), but there is a 2000-mile-diameter circle with lots more signals calling the shuttle. Some stations call on 145.55, Owen's frequency, and are chased off! Afterwards, some comments from the 75m band: a WØ "did not hear a thing," a K5 "had my four boomers on him, heard nothing." Oh well, there is another pass tomorrow. Later in the evening, I hear Owen had been on over California on orbit 40. So, there *is* life up there!

Thursday, 1 December: Orbit 49A: Another dud. By now everybody just calls on the odd minutes and listens in between. I keep switching my three antennas, although I had calculated that even with a simple dipole he should be putting in a signal of S9 and 9+20 when overhead. Nonetheless, every dB should help on transmit.

Friday, 2 December: Only one good pass for our area at 6:00 pm. Again we have no luck; we have a club meeting tonight and a computer presentation is scheduled. During the day we had our first few inches of snow and as usual all kinds of problems with the automobile traffic. Three of us go together to the club meeting which turns out to be cancelled because of the poor weather. I had prepared a short presentation on the space shuttle and also a handout with orbit information through Tuesday. We have some lively discussion with the few people that showed up. The late news on TV shows some Kettering hams in a shopping center parking lot with a hand-held cross yagi. A good picture with the snow and rain pouring down; of course, they had no luck! It became known that the astronauts, including Owen, are kept very busy and that they are requesting an extra day in space.

Saturday, 3 December: This is a resting day for the US hams. The shuttle will be over Europe, Africa, and Asia. I consider putting up a brand-new antenna, 2×10-el cross yagi by TET, which I picked up Thursday night from Dan WD8IDZ. But because of the cold weather and the rain, I pass that up.

Sunday, 4 December: Orbit 97A: 9:55 am. This orbit starts like all the previous ones. Everybody calls, no response from the shuttle. Then out of the blue sky, at about 10:08 EST, there was Owen, loud and clear on the IC-2AT, S9 at least. For a moment I thought some local John was impersonating him. Owen says he hears a lot of stations, and not wanting to waste any time with acknowledging, he is just going to listen for the next 80 seconds. He also says he is just now over Texas, heading for the midwest. This is the signal we have been waiting for, and for the next ten minutes, everybody in the Dayton area calls. We do not hear him again, and I do not have a recording of his transmission.

During the next orbit, which is almost out of reach for us, over in the west, we call again but do not get a response. Afterwards I talk with Leo WA8ZHE and he surprises me with a super tape recording of an earlier unscheduled pass (orbit 96, 8:34 EST) where Owen actually confirms K4GFC and another K call.

Well, at least we heard him after all these days of frustration. Some success, and there is a chance that we are on the tape.

Monday, 5 December: Orbit 113A (9:42 to 10:05 EST): Although passing several hundred miles to the west of us, this ought to be a good chance. I call a lot and listen carefully on the even minutes. But there is no response. Today there is a lot less activity locally. It is a working day and also possibly a number of hams have exhausted their patience; good for the remaining ones. We had another telephone conference last night with other

hams from all across the US—including Alaska and Hawaii—skillfully conducted by Jack Burnett, Executive Editor of *73*. Hams from the larger metropolitan areas (LA, Chicago) complained about tremendous interference (intermod) and suggested it might be best to use a small antenna, such as a rubber duckie on a handie-talkie. No such problems were encountered in the Dayton area. By noontime we have to leave Dayton for Huntsville, Alabama, to do some receiver testing for the QRL. This is a 10-hour drive and we will have to stop over for the night. Driving south, we listen to the radio, mostly news about Lebanon, but then there is the 3-way conversation between President Reagan, West Germany's Chancellor Kohl, and the astronauts. Leaving a dreary and cloudy Ohio behind, we find some sunshine in southern Kentucky. We finally pull in for the night south of Nashville, Tennessee. Here we are in the Central time zone and with some "sharp thinking," the next 3 orbits are converted to local Central time. I brought my hand-held IC-2AT, an HB9CV portable antenna, and a tape recorder. My chances are rather slim to be heard with the low power (1 Watt), but I might get a good tape recording of Owen.

Tuesday, 6 December: Today there will be several good chances to pick up *Columbia*. Unfortunately, we will be traveling, setting up equipment, or in meetings with other engineers a lot, but I will try to break loose whenever Owen is in reach.

Orbit 129A, 8:30 am CST: We are at guardhouse no. 9 of the Redstone Arsenal, Alabama, checking in and waiting for an escort. I listen on my IC-2AT and hear nothing, but there are some locals who, after so many days, still do not have the frequencies straight. They are being chased off. Only a few stations call, so I try my luck again on this pass. Owen does not show up.

Orbit 133D, 2:45 pm CST: This orbit passes over New England, so the local stations do not even try to call the shuttle this time. However, I am at an excellent location this time and should try. I am next to NASA's Marshall Space Flight Center on top of one of the old static missile test towers, 250 feet up in the air. We can see for miles around; large areas on the ground are flooded from the recent heavy rains; I regret not having brought my binoculars. The Space Flight Center, by the way, is a complete ground-control station for the shuttle, like the primary one in Houston, Texas, and could take over operations immediately, if necessary. They have a press center set up, but there is little activity, since the scheduled teleconference with the astronauts was cancelled. The tape recorder is plugged in and 250 feet up in the penthouse we listen on the IC-2AT for the space shuttle. Unfortunately, we hear nothing. Now there is another orbit in 90 minutes; during this time we have to look for accommodations for the night. We have no reservations. Eventually we find a motel, but with the rush-hour traffic, we are a few minutes into the next orbit when we check in.

Orbit 134D, 4:18 pm CST: By the time I am in my motel room, it is 4:30. Immediately I turn the 2m radio on and after a short moment I hear some crackling noise that sounds like a voice. I grab the handie-talkie and rush outside to be in a better receiving position. There is Owen again loud and clear: "OK, here is W5LFL, over the beautiful Mississippi. I have to take a picture of that, but I also have to listen to the radio. . ." He is loud and clear on the hand-held IC-2AT with a rubber duckie. Immediately, I make frantic efforts to hook up the tape recorder for his next appearance. We cannot take the recorder, connected to an outlet, outside the room, and we do not hear Owen again.

For the next 2 days we will be very busy with an assignment, so we conclude our space-shuttle diary at this point. In hindsight, it was quite worthwhile. Although at times frustrating and no QSO resulted, we did hear W5LFL on 2 occasions, and Owen's voice from the space shuttle *Columbia* (on STS-9) will be impressed on my memory for a long time.

KC8JX

Larry Knapp KC8JX
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Stevensville MI 49127

"KC8JX, this is W5LFL." No, I never heard that. But oh, what a thrill it would have been if I had! Several in our fraternity heard it, including my good friend Jeff W7ID. It certainly wasn't for lack of trying—I was there for every orbit that could possibly be heard from southwestern Michigan.

It's amazing how such an event as this can make inactive hams active. I heard stations on 2 meters I didn't even know existed. Was there interference? Yes, a little. But after the first few days it was negligible. How did *you* prepare for this historic event? This is what I did.

First, I had to have an antenna. I had a Ringo Ranger, but I didn't think that would work very well, so I built a turnstile similar to those described in the *Handbook*. This was my first attempt at homebrewing, and it seemed to turn out very well. It certainly whets my appetite for more VHF antenna work. My boom was an old shovel handle and my elements, wire. The calculations of element lengths, phasing lines, matching sections, and reflector spacing were definitely more difficult than the 40- and 80-meter dipoles I built. I mounted the antenna, such as it was, on an unused tetherball pole and hoped for the best. This was all completed prior to the shuttle's launch.

On November 27, I participated in a teleconference call and received much valuable data which I passed on to local networks. This information was very helpful and held true throughout the mission. I tried throughout the week to get updated information through the telephone numbers which were published, but I finally gave up as the lines were always busy. All updated information was obtained nightly by listening to the AMSAT net frequency of 3850. I never was able to hear W5RRR, though I understand they were on the air.

It was now November 28, and the shuttle lift-off was perfect. Now the adventure could really begin. I had trouble figuring out the exact orbit times since they were given to me in mission elapsed time. I had never done any satellite work before, other than listening for OSCAR on 10 meters, plus I did not have a microcomputer handy to use. Today I also found that the speaker on my Yaesu FT-208R was inoperative, so I had one of the Heath technicians fashion a phone-jack patch cord. I could then use a remote speaker with the patch cord placed in the phone jack of the FT-208R. Now at least I could listen to the transmissions through a good speaker and, thus, any tape recordings would sound better. My turnstile could not be placed outside, as with the first winter storm approaching, high winds and snow could ruin my investment.

November 29 was still very cold and windy, so I still could not mount the antenna outside. It was good that no shuttle communications took place that day. I procured a VL-2280 from Dave Poplewski KC8IV at Heath Co., so my hand-held would have some punch—12 Watts. As the day ended, one final item had to be set up—my tape recorder. These last 2 days had been disasters at work, and consequently, I had to spend 3 to 4 hours each night fixing problems there. I was, therefore, late in getting everything set up. A real bright point of the day was finding the local repeater, KD8S (145.47), was broadcasting the shuttle communications. This was very convenient for us in southwestern Michigan and northern Indiana because of the current information being disseminated there.

November 30 arrived, and first communications with the shuttle were expected today. I was not able to be at home, but instead listened for the shuttle in the Heath Company Engineering Department. Owen was not active at that time. I then listened for the next flyover at 8 pm, orbit 39D. Still I didn't copy W5LFL. I am really wondering at this point whether my antenna works. By this time, the wind has really died down so I could put it up outside. I am also trying to find W5RRR on 20 and 40—no luck! At 8 pm, everyone in SW Michigan was calling W5LFL, many right on 145.55. Two meters finally sounds like 20-meter DX even with guardians of the frequency. Tonight also was the night for my weekly schedule with W7ID. After establishing contact, I found out that W5LFL had made his first contact with WA1JXN/7 in Montana at 0234Z, December 1st. These first reports indicated very strong signals from the shuttle; there were even some who heard him on hand-helds. What a thrill it must have been! Jeff W7ID forgot to turn on his tape recorder. Hope that won't happen to me. Tonight, I also listened to W1AW's bulletin and tuned in on 3850 to try to get more information.

On December 1, there were no scheduled communications orbits. I spent the day listening to the shuttle on the 145.47 repeater and tuned in to the W1AW bulletins and 3850.

Orbit 70D was deemed possible

Larry Knapp KC8JX

for December 2, so I was really ready this time. Oh, the QRM on 145.55! After this pass we really should gather on some repeater frequency and inform the multitudes, so we did. I guess because of Friday night, we really had a turnout on almost all Earth-to-shuttle frequencies. Found out −600 split on hand-held from 145.55 puts the transmit frequency on 144.95. I wonder how many of us were using this. I am trying to stay on 145.01 or 145.09. There don't seem to be many others there. No luck locally hearing 70D or 71D orbits. I'm really starting to doubt my station's capabilities. I did hear a tape made by someone in California who had good copy of W5LFL. Maybe that's the closest I'll ever come!

December 3—no flyovers scheduled. I spent the day with my family, doing some necessary Christmas shopping.

It is now Sunday, December 4, and I'm really hoping that today on orbit 96 or 97 I'll be able to hear W5LFL. I have given up most of the hope I had earlier of having my call answered, as it seems from information I have received that only those with power and good directional antennas will be answered. If I could only hear him, I'd be pleased! Then, finally, on orbit 97A, I heard him at 10:08 EST! Holy cow, was I thrilled! I was yelling for the family to come and listen. Maybe I'll even work him! (No, I didn't forget the recorder; in fact, I've got 5 minutes of my call on the recorder as I was afraid to turn it off lest I miss some of Owen's comments.) I did it! I did what I thought I could probably do—hear him. I doubt very seriously he'd ever hear my 12 Watts to a turnstile. Some of the local operators heard the earlier eastern pass, orbit 96. I didn't, but on the central pass, orbit 97, no one recorded any more than I did. I feel fortunate. I really am fired up for Monday's and Tuesday's passes.

December 5 was a disaster! Some of the locals picked up the eastern pass, but I didn't. I stayed home from work in the morning just for these flyovers. Now I'm ready for 113A. Darn news conference! He wasn't on.

December 6 was the last day I heard Owen—weak, but readable. I also found out that one of the local operators, KD8S, thought he was confirmed. I also stayed home from work this morning. Won't be able to do this much longer! The weather has turned worse as our first snowstorm appears. I took down the antenna. The spaceflight is nearly over now.

December 7. I had to be at work early. I did receive a call at work that W5LFL was heard briefly on both the eastern and central passes.

Well, I accomplished several goals just as the space shuttle did. I appreciate much more now VHF communications and the relative ease in constructing VHF antennas. It has certainly whet my appetite for OSCAR and VHF work. The entire experience has thrilled me just as much, if not more, than my first Novice contact almost 23 years ago, or the first time I heard OSCAR on 10 meters. What a thrill it must have been for Owen Garriott to hear WA1JXN/7, JY1, W7ID, and others. Would I try it again? Would Owen W5LFL? You bet!

I'd like to thank *73* magazine for its help in providing timely information and my co-writers for their support. But my special thanks go to my wife, Carol, my son, Alan, and my daughter, Amy, for their patience and their expert strong-arm motor control of my antenna. Their enthusiasm for this project for Dad is really appreciated. My coworkers, who were very interested and supportive, get special thanks as does Heath Company and fellow employees Dave Poplewski KC8IV and Ion White WAØTAQ. Without all of these people, I could not have been half-successful.

Larry Knapp KC8IX has been a licensed ham since 1961 and holds an Advanced-class license. After graduating from Illinois Wesleyan University in 1967, he went to work for Heath Company in the Credit Department. After a 4-year hitch with the Air Force at Keesler AFB, Mississippi, he returned to Heath and is currently Data Processing Manager. He is married and has two children, ages 12 and 9, and another one on the way. He has held the following calls: K0FRI, W9HXG, W5VUF, and W8IHE. His main enjoyments other than amateur radio are writing, camping, volleyball, and golf. He is active primarily on HF in contests and DX, finally having achieved DXCC in 1983. His primary VHF activity has been 2 meters with a hand-held purchased in 1983. He is a life member of the ARRL and has been president, activities chairman, and secretary of the local Blossomland Amateur Radio Association (BARA). He writes articles for the club bulletin and also was the chairman for the club's expedition in 1981 to Mackinac Island.

W9HD

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What follows is a log/diary of the past few days. First, to introduce myself very briefly, I am a retired electronics engineer who has had a ham license for 51 years. Instead of rocking and reminiscing, I sail on deep-sea oil tankers several months per year as radio officer.

Saturday, November 26: Received a telephone call from Jack Burnett, Executive Editor of *73* magazine. He asked if I wished to participate in an effort to contact W5LFL aboard the space shuttle *Columbia* and write up the results. It certainly seemed worth a try. I happily agreed to do so, noting that my 2-meter station is not much beyond the ordinary. I have an Icom 25A and a vertically-positioned dipole made from rod stock and mounted halfway up my 50-foot TV antenna mast. It has served me well for ten years. I also have a Tempo S-15 handie-talkie with rubber duckie.

Sunday, November 27, 4:00 pm: A conference call, lasting an hour, with Jack Burnett, Randy Stimson KZ7T, Bob Harnois K1EFZ, Dave Manley KH6B (in Hilo, Hawaii), Jon Gallo KB6WT, Wanda Lovejoy KO2X, Bill Pasternak WA6ITF, and many others, including one in Alaska. Orbit times, frequencies, and procedures were given—all the help that could come over the telephone was given so that we might be successful in contacting Owen Garriott W5LFL on the *Columbia*. With my conventional gear I had little hope of making contact, but I responded to the enthusiastic spirit of "Go gettum, boys." And I looked forward to a busy week which included five evenings with a Civil Defense course in Radiation Monitoring Instruction.

Note that in subsequent entries, most times will be in UTC. Since midnight UTC comes at 1900 local time, some early-hour UTC entries are under the preceding day's date.

Monday, November 28: First order of business: organizing notes from yesterday's lengthy conference call. Then I made up a paper slide rule for computing day, hour, and minute past launch into local time and date. Not wanting the low-band station to suffer, I spent some time setting up the newly-acquired TI99-4A and interface with the Icom 720A. Made RTTY contact with W1AXL on 20 meters. Also am committed to ringing the bell for Salvation Army two afternoons. •2300 to 0145—Attending CD class with HT tuned to 145.55. Nothing heard.

Tuesday, November 29: •1530 UTC—carrier heard on 145.55 (no modulation). •1531—Called W5LFL on 144.95. No answer. •1535—Called W5LFL on 144.95. No answer. •1608—A few squelch breaks on 145.55. Nothing intelligible heard. •1631—More squelch breaks on 145.55. •1633—N9EBI calling W5LFL on 144.95 (so I joined in the calling). No reply heard. •1645 to 1820—At Rotary Club meeting. HT along. Nothing heard. •2300 to 0130—Attending CD class with HT. Nothing heard.

Wednesday, November 30: •1500—Now scanning with 25A 145.54, −.55, and −.56; also reply frequency of 144.95. No signals heard. •1710—K9UGO calling W5LFL on 144.95. •1713—Called W5LFL on 144.95 in the clear. No answer heard. However, a carrier heard (weak). Does not end at beginning of odd minute. •1750 to 1920—Ringing the bell for Salvation Army. HT along. No signals. •2300 to 0150—At CD class. HT along. No signals.

Thursday, December 1: •1220—Left Bloomfield for Indianapolis, 70 miles away, to pick up daughter at airport. Have Icom 25A with ¼-wave mag mounted on car's back deck. •About 1530—Heard WA9RDF in QSO on 145.55, not with W5LFL. When asked about his use of 145.55 simplex, he stated that he had been using that frequency regularly for several years and saw no reason for leaving it now. •About 1547—Heard several stations calling W5LFL, so joined them. No answer heard. •2300 to 0139—At CD training with HT. No signals heard. Squelch broke due to low batteries. Interrupted the instruction. •0457—Staying up late tonight. Weak carrier heard, but not cutting off on the odd minutes. Not W5LFL. And so to bed.

Friday, December 2: •1712 to 1714—Carrier but no modulation on 145.55. •1715—W9LUU calls K9OMV on 145.55. •1721—Station heard on 144.95 calling W5LFL. I joined in, except my Icom was in simplex mode, and I was so informed by others. No reply heard from W5LFL. •1914—W5LFL heard for the first time (not strong; in and out). •1915—Called W5LFL on 144.95. No answer. •2300 to 0330—Final CD session with HT along. Was issued a diploma as Radiological Monitoring Instructor.

Saturday, December 3: •1400 to 1430—Busy on low bands, Saturday morning skeds. •1456—Several stations calling W5LFL. •1457—Called W5LFL on 145.95. No answer. W5LFL not heard. Busy most of the day with errands, putting up Christmas tree and lights. Numerous "Honey do" jobs. Also monitoring 145.55. •0235 to 0250—High-altitude aeronautical mobile KXØA heard and recorded over Tennessee at 42,000 feet. He called in on 145.55, but QSYed off like a gentleman.

Sunday, December 4: •Up at 7:30 am, scanning the frequencies while reading the Sunday paper. •1334—W5LFL heard weak but readable, calling CQ. •1335—Called W5LFL (on 144.94 to avoid any possible pileup). •1336—Believe I heard my call, "W9 Hot Dog" from W5LFL. (Quite weak, barely readable.) Then his signal came up. He stated that he was flying over Florida. I felt reservedly elated. Unless others heard his transmission, I would have to wait for mail confirmation. •0200 (9:00 pm local time)—Another nationwide conference call with the same list of participants. I was happy to announce my contact with Owen Garriott. What really made it great was that one of the conferees, Bob Harnois K1EFZ, had heard Owen over Florida make that 1336 UTC transmission, and thought that W5LFL had called "W9 Hot Dog." My suggestion during the telephone conference was to not wait for the orbit times but to

call when he was heard, and to call on other than a pileup frequency if possible.

Monday, December 5: Took a holiday. Monitored occasionally. Heard a few squelch breaks. Had a CW QSO on the HF bands. Joined my comrades on the FRUPAC Net at noon local time. Monitored 145.55 on the Icom 25A, but W5LFL was not heard.

Tuesday, December 6: •1307 to 1315—Activity heard. No W5LFL signal identified. •1427—Called W5LFL on 144.94. No reply heard. (Other stations were calling him on 144.95.) •2030—Local newspaper arrived. I am featured on front page. Wow! •2230—Heard him loudest and strongest to date. •2231—Called W5LFL on 144.94. •2232—W5LFL, loud and strong, says he is over the Mississippi River Valley and it looks good down there. No callsigns were mentioned. •2233—Called W5LFL on 144.94. No reply heard. He is now QSAØ.

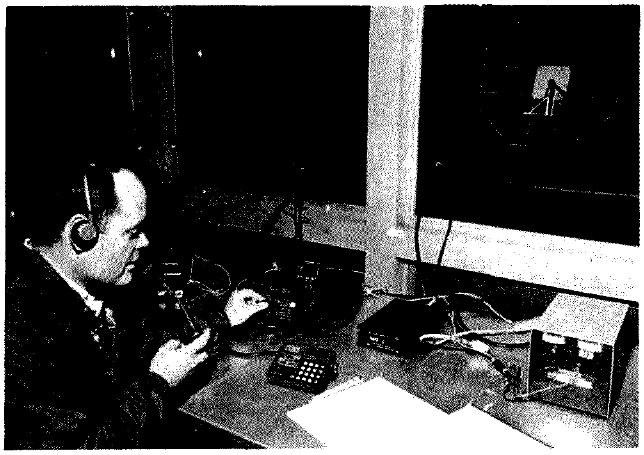
Wednesday, December 7: •1432—Heard "CQ North America" from W5LFL. Nice, strong signal. •1433—Called W5LFL on 144.94. Nothing heard. •1555—Called W5LFL on 144.94 because others heard calling on 144.95. No answer heard. •2218—Heard W5LFL talking briefly. •2219—Called him on 144.94. No answer heard.

Thursday, December 8: •1423—Called W5LFL on 144.94. No answer heard. •1610—Suddenly remembered that this is due at *73* magazine immediately if not sooner.

I am glad to have had the opportunity of participating in this effort and to have had the good fortune to at least hear Owen Garriott aboard the *Columbia*.

Paul L. Schmidt W9HD, 68, a member of the ARRL, has been continuously licensed for 51 years. A shore-based radioman in the Navy's FRUPAC organization in WWII, he is married and has 4 children and 5 grandchildren. His employment is now on deep-sea tankers and supertankers as radio officer. In 1977, he spent six months on a Navy tanker in the Orient and made a trip around the world in the process. In 1978, he sailed on a supertanker around the Horn from New Orleans to Valdez, Alaska. In 1980, he was on a grain boat to Israel via Bermuda, and in 1982, his tanker put in for overhaul at Khalkis, Greece, and the entire crew was repatriated to the USA.

His hobbies have always included amateur radio as well as photography, writing, and traveling. ("We will ride on anything that moves," he writes.)



George Isely WD9GIG at the mike; the antenna which was constantly adjusted can be seen outside.

WD9GIG

George R. (Dick) Isely WD9GIG
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Various articles about the upcoming STS-9 mission with an amateur-radio operator, Owen Garriott W5LFL, aboard appeared in early 1983 in several amateur-radio and aviation publications, and I began to follow W5LFL's project with increasing interest.

August: The ARRL's videotape of "Amateur Radio's Newest Frontier" circulated—first midwest showing at Fox River Radio League Hamfest. Began to seriously think of trying to work W5LFL. My neighbor, Bill Smith W9LRG, and I discuss the best way to reach W5LFL while he is in orbit. We decide to construct a two-meter helical antenna based on the design work of John D. Krause W8JK.

Early September: Bill W9LRG completes work on a computer program for designing a helical antenna. I adapt his program for use on my home computer system.

Late September: Helical antenna construction started. Mathematical error results in wrong helix configuration; must rebuild helix.

October 18: STS-9 mission delayed ... helix reconstruction underway.

November 9-10: First helical antenna tests using a tapered feedline match ... antenna works, but swr too high.

November 15: Matching pi network installed and tested. Perfect match of approximate 140-Ohm feedpoint impedance to 50-Ohm coaxial cable.

November 30, Orbit 39D: First communication attempt with W5LFL. No signals heard from space shuttle *Columbia* ... heavy QRM on W5LFL's downlink frequency of 145.55 MHz by strong local station.

December 1, Orbit 49A: 2nd communication attempt ... no signals heard, but the QRM level is a little lower.

December 2, Orbit 70D: 3rd attempt ... still no signals from *Columbia*. Live CBS television coverage of this orbital pass and following pass. Disappointment for all concerned, but the coverage on TV was very good (shown during 6:00 pm news).

December 2, Orbit 71D: 4th attempt ... same as previous pass, no signals heard from *Columbia*. No signal reception reports by other hams in this area, either.

December 4, Orbit 97A, 8:55 to 9:23 am CST: 5th attempt ... finally some success. W5LFL is heard saying that he is "not transmitting callsigns back ..." On this as on all orbital passes, transmissions are made from this station during the odd minutes of each scheduled pass. By this time we are painfully aware that our helical antenna must be carefully tracked along the predicted space-shuttle flight path if we are to hear W5LFL. Movement of as little as 5 to 8 degrees shifts incoming signal from S-9 to down in the noise level.

December 5, 8:30 pm CST: Participate in 17-point conference telephone call put together by Jack Burnett of *73* magazine to discuss the W5LFL operation and the amateur community's efforts and results to date. Except for Pacific Northwest and Florida areas, nobody is having much success. Several suggestions are exchanged within this group about what techniques and antennas may or may not work. It is apparent that "new ground" is being broken with this operation. •*113A, 8:42 to 9:05 am CST*—Another overhead pass, as were orbits 70D and 97A. More suc-

Earth to Columbia: long distance calling

By Jan Myers
The Beacon-News

ST. CHARLES — "Columbia, this is WD9GIG," Dick Isely said over and over as he shot his radio signal 150 miles up in the air, trying to talk to astronaut Owen Garriott Friday evening.

"He's coming into us, Bill, it's noisy but I can read him," Isely shouted to his fellow radio ham, Bill Smith, as Smith kept adjusting the antenna in the back yard of the Isely home in St. Charles.

The pair, along with several other members of the Fox River Radio League — and assorted media — were standing by to beam ham radio signals to Columbia-Spacelab crew member Garriott as the craft's orbit came within 150 miles over the Midwest.

Every other minute, with a format suggested by NASA, Isely would broadcast his call signal heavenward hoping that in the following minute Garriott would respond.

Isely didn't expect a long, chatty conversation with Garriott — it would have been enough if he'd just said hello.

But, that didn't happen.

For the 20-minute periods between 5:05 and 5:25 p.m. and again from 6:35 to 6:55 p.m. Isely and Smith tried to communicate with Garriott without success.

Isely would repeat his call signal for the one minute period. Then everyone on the backporch of Isely's St. Charles home would hold their breath in anticipation — waiting for the voice from on high.

There was nothing but static.

Then Isely or Smith would fiddle with the dials on the receiver, make more adjustments on the angle of the antenna, squirm under the bright television lights and then try again.

"That's the life of a ham radio operator," a club member said.

"We listen a lot."

Isely began to get impatient. "Come on, Columbia, this is WD9GIG," he said over and over managing to get in about eight calls a minute.

"Go vertical, Bill. Tip it (the antenna) to the northeast — swing it east," Isely shouted.

Then another long minute passes and Isely is again saying his call signal.

And, so it went throughout the two attempts to reach the astronaut.

Since last Wednesday and during the upcoming week, ham operators throughout the U.S. will attempt to talk to Garriott as he orbits in space.

Garriott, one of two mission specialist on the six-man Columbia-Spacelab crew, is a lifelong ham operator. He is using his own time to pursue his hobby from space.

Chances of making contact with Garriott are slim, Isely said.

"If the antenna that is on a small window of the spaceship is facing downward we'd have a better chance of receiving his signal. But, the ship may be upright and that means Garriott's radio signals are going into outer space.

"The antenna on the spacecraft is only five watts. He may have answered us and we didn't hear him," Isely said.

Other ham operators across the nation have heard Garriott's ham radio call signal W5LFL and he has acknowledged hearing some from earth.

One of the first was Garriott's fellow club member Ken Schnell, a budget analyst at the Johnson Space Center.

Isely and Smith said they have been planning for this week for about six months.

"When we heard that Garriott would be taking the ham radio equipment aboard the Columbia, we decided to build a special antenna and attempt to communicate with him during the space flight."

Columbia was originally set to lift off in October, but the flight was delayed.

That delay helped Isely and Smith ready the antenna (the same type as used by NASA) which they designed and built, using ordinary items purchased at local hardware stores.

With their radios, the pair estimate they can produce about 1,000 watts of power — enough to bounce a signal off the moon.

Although Friday's attempt to communicate with Garriott was unsuccessful, Isely and Smith said they intend to keep trying.

"We have an excellent chance of getting through about 8:55 a.m. to 9:23 a.m. Sunday morning when the craft will pass over Monterrey, Mexico, to Flint, Mich. The spacecraft's track will be over central Indiana area about 9:23 a.m. and we may be able to make contact then," Isely said.

Ham radio buffs will get other chances to beam their signals skyward between 8:42 to 9:05 a.m. Monday, and two chances on Tuesday at 8:29 to 8:50 a.m. and 4:18 to 4:35 p.m.

cess in hearing Owen Garriott on several different antennas. My partner, W9LRG, is sick with the flu and I am not able to track the helix and operate at the same time... used a 14-element yagi controlled from my permanent shack in the basement.

December 6, Orbit 129A, 8:29 to 8:50 am CST: Overhead pass again using the same antenna as used in orbit 113A... my partner still sick in bed. Heard W5LFL confirm one 5th-area and two 8th-area calls on this pass. I begin to suspect that a different propagation mode may exist than what has been predicted. Decide to work the next (western US) pass to try out my idea. •*Orbit 130A, 10:10 to 10:20 am CST*—Using yagi antenna again, W5LFL is as loud or louder than on previous overhead pass, and I hear him confirm a 6th-area and two 9th-area calls even though he is over the Colorado area. Perhaps the path is better when the space shuttle is at or near the local horizon? •*Orbit 133D, 2:44 to 3:06 pm CST*—No signals heard on this horizon pass to the northeast of my QTH. •*Orbit 134D, 4:18 to 4:48 pm CST*—Two local area hams (Jim Emma KA9HQF and Gary Senesac KC9UM) take time away from their jobs to help me operate the helical antenna for this orbital pass. I finally obtain some adjusted azimuth and elevation figures, courtesy of W9TGB, to use for this pass. We have spectacular results...we copy W5LFL for three consecutive transmissions between 4:30 and 4:33 pm CST even though *Columbia* is only 10 to 15 degrees above our horizon to the southwest. This is my last attempt to communicate with W5LFL, and it is the best of the lot if my reception of his signals can be used as a measurement.

Observations and Comments

1. Most of the QRM on Owen Garriott's transmit frequency is accidental. In most cases, the operator in error breaks off in mid-call. Some of the worst local QRM is from the "Kilocycle Cops" trying to "keep the frequency clear" rather than from the problems caused by the inadvertent offenders.

2. Our helical antenna is much sharper in bandwidth than first predicted. This is both an advantage and a problem. The helix is almost completely immune to ground-based QRM, but is very much harder to lock onto the space shuttle, which moves quite rapidly across the sky.

3. Even after the STS-9 mission was in orbit, there was still a considerable amount of confusion about frequencies, transmission protocol, and orbital parameters. I have no suggestions to make to improve this situation...some people just never get the word.

4. Lack of widely-published orbital parameters tend to favor individuals with "connections" and previous experience with tracking antenna arrays—stacked beams in EME configuration, etc. These people could construct early into the mission, using the orbital numbers to track *Columbia* through the sky reasonably, while most of the amateur community had to rely on second-hand (often inaccurate) information. The ARRL did finally put out a bulletin on December 6th listing the STS-9 orbital parameters. Perhaps this data could be released a little sooner?

5. There appears to be some type of two-meter propagation phenomenon for low Earth-orbital communications different than that predicted. I suspect that W5LFL's transmission path was somewhat different from that of stations transmitting to him in the space shuttle. Ground-to-space propagation appeared to be best when the shuttle was at or near the local horizon while space-to-ground propagation appeared to be relatively constant regardless of *Columbia*'s elevation above the horizon. This may be a function of *Columbia*'s attitude with respect to the Earth's surface at a given point in time when W5LFL was on the air. I have no way of determining this from the information available to the general public.

6. A plot of table-of-observed-propagation distances using these factors discussed in paragraph 5 above could prove to be valuable for future operations of this nature.

7. It would be a great help to have a low-power amateur-radio beacon on future space shuttles where amateur-radio operation is to be attempted. As little as one Watt output should be sufficient for this purpose and would make it much, much easier to track the vehicle through the sky.

8. If possible, future amateur-radio operations from space should be conducted using spacecraft power either directly or by means of rechargeable battery packs so that power consumption in the transmit mode does not become a limiting factor. I have been led to believe that W5LFL had this constraint particularly when the STS-9 mission was extended by one day.

9. This was my first serious attempt at any form of space communications and I am quite pleased with our results—even if we do not obtain a two-way-contact confirmation. Bill Smith and I plan to modify this helix to a two-band configuration for OSCAR use in the near future. We sincerely hope that this will not be the only amateur-radio-from-space operation...we are looking forward to future operations of this type.

George Richard (Dick) Isely WD9GIG was born in 1939 in Ironton, Missouri. A full Navy scholarship to college graduated Dick as an officer and also obligated him to several years of service, which came after his marriage to Judy Miller. He became a naval aviator assigned to active duty with an anti-submarine squadron flying P2Vs over the Atlantic off the coast of Maine. After deployments in Sicily, Spain, and Cuba, Dick resigned his commission, in August 1966, and left the navy for civilian piloting with American Airlines. For 16 years he has had an active career as an American Airlines pilot and currently flies 2nd seat (copilot) on the Boeing 727. Dick got into ham radio literally by accident: a bad fall resulted in a broken leg. Frustrated by enforced inactivity, he started off with CB but soon graduated to ham radio. He has been Fox River Radio League president, during which time he was active in setting up "The World's Highest Ham Shack" on the observation deck of the Sears Tower in Chicago. With permission to stay overnight (never before allowed by Sears) and transmit and receive signals from all over the world, the FRRL gained for amateur radio a healthy shot of good publicity. In St. Charles, Dick has been prominent on the city's cable TV advisory committee.

KO9G

Pete Altman KO9G
1307 E. Pershing Avenue
Wheaton IL 60187

As luck would have it, my 2-meter rig developed an untraceable intermittent on top of this event, even though I was prepared with a 2-meter turnstile antenna on the roof and good clean coax connections in between.

With no chance to borrow another rig, I wound up serving as a "clearinghouse" for flight info, frequencies, etc., for fellow hams in the neighborhood. The current data given via our conference call prior to lift-off was made available to a number of amateurs in the area via both the local repeater and land lines. It encouraged their attempts to give real tries at contacting W5LFL.

Art Lang KR9K made several attempts using a TR-9130 running barefoot into a 20-element twist antenna. (Given the pressure of work, Art has been unable to furnish a written report.) He reports hearing W5LFL loud and clear on 3 passes (no confirmed QSL though) and was able to tape Owen's transmissions. Art reports that W5LFL was within good hearing range for roughly two minutes of each pass over this (midwest) area and that Owen was able (within that 2-minute opening) to confirm two or three contacts directly. Art also reports that KA9PUC, on vacation at the time in Florida, believed he was able to make a confirmed QSO with Owen using a 2-meter handie-talkie and a rubber duck.

Eugene "Gene" McAleer N9DUW submitted the following:

"On November 30, while in Atlanta, Georgia, I secured permission to go up on the roof of the Marriot Hotel

(17 stories plus) and listened for STS-9 and W5LFL but to no avail. No one in the area heard a signal as I understand and me with such a vantage point with my HT.

"On December 6 at 2214Z, I heard his (W5LFL's) call only very briefly and again returned the call using my Kenwood TR-7600 (10 Watts out) as I had done the previous day. My antenna was a Hy-Gain 5/8-wave ground plane approximately 20 feet above the housetop. (Gene is an airline pilot and on 12/6 was back at his home QTH.)

"Of course I recorded all this as well as a *very* clear signal from one of our club members (whom I shall leave nameless) calling W5LFL on the downlink frequency—hi.

"It was an enjoyable experience to have the signal direct and I was a great deal disappointed in the conduct of (fortunately) only a few of our fellow hams.

"My thanks to Goddard Space Center Amateur Radio Club (WA3NAN) for their very informative rebroadcast of the STS-9 communications.

"My QSL is on the way to the ARRL and I hopefully await a confirmation.

"That's it, Pete, short and direct."

The general consensus was that if you knew the orbital times (we did, thanks to Dick Isley WD9GIG, who "normalized" them to local time on his computer), you could easily hear the signals on 2 meters from the shuttle—for roughly 2 minutes out of each pass over the area—and readily with a receiver of average commercial sensitivity and almost whatever antenna you had on hand.

Making sure you're heard by an orbiting amateur, especially with crowded conditions in some parts of the country and short access times, apparently needs enough erp to "bust through."

Pete Altman KO9C is a copywriter and technical writer (and a lousy typist) who first got his ticket in 1954 (KN2MSM). He rejoined the ranks 5 years ago as N9AWF and earned KO9C two years ago—mostly because the 17-year-old next door (KA9EAT) got his Extra-class ticket (and who wants to live next door to that?).

Art Lang KR9K is an electrical engineer. He is one of the more active people in the area working satellites (contributed several contacts via Russian birds to the Field Day score) and is now even better prepared with a new tower installation. KR9K is also current president of Wheaton Community Radio Amateurs.

Gene McAleer N9DUW is a commercial airline pilot, especially active on the low bands chasing DX (his work schedule allows more time for 10- and 15-meter band openings).

THURSDAY, DECEMBER 8, 1983—CHAFFEE COUNTY TIMES—PAGE 1

Move over, Miss Piggy!

BV men await 'Hams in Space' sequel

A few years ago, the Muppets made a movie called "Pigs in Space."

But now the talk is about "Hams in Space."

Three Buena Vista ham radio operators listened in on the first ham broadcast from outer space last Friday—and the men are hoping that their broadcasts to the space shuttle Columbia were picked up by a recorder on the shuttle.

Art Ermish, whose call letters are KC0VL, Ken Eigsti, W0LSD, and Terry Huston, W8FK were among the ham operators from all over the world to hear the broadcast last Friday from the first-ever ham in space, Dr. Owen Garriot.

Garriot, a Columbia crew member and amateur radio operator, carried a small amateur radio station aboard the shuttle so he could contact hams around the world during the few off-duty hours he had away from his heavy astronaut workload.

"The unique feature of this event is that until now, no one ever had a chance to talk back to a spacecraft other than official NASA communicators," Huston said.

But, last Friday, Eigsti, Huston and Ermish were calling on their amateur radio stations as the Columbia sped over the night sky.

It took only about six minutes for the spacecraft to travel from the northwest to southwest horizon, so the timing had to be perfect, the men noted.

Ermish was able to hear the shuttle on his home base station while Eigsti was listening in on his mobile car radio and Huston heard Garriot on his portable walkie talkie.

"The signal from outer space was quite loud on all three of their stations," Huston said.

There were so many amateur radio operators calling the shuttle at one time that all the call signs were being taped/recorded by the ham in space so that he could sort out the individual calls when he got back to Earth.

So perhaps other than just hearing the first-ever ham signals from outer space, one of these Buena Vista hams may have made one of the first radio contacts between civilians and astronauts in outer space.

Huston says the three men are anxiously awaiting the return of the shuttle to Earth, carrying its precious tape recorded cargo."

Stay tuned.

SPACE HAMS—Three Buena Vista men heard the first-ever ham radio broadcast from outer space last week. Ken Eigsti, left, Art Ermish, and Terry Huston also transmitted messages to the Space Shuttle Columbia.

W8FK

Terry L. Huston W8FK
Box 1417
Buena Vista CO 81211

After all the weeks of anticipation, there he was. I mean right there on the speaker of my little handie-talkie was the first ham's voice from outer space. I was in such a state of disbelief that I almost forgot to press the push-to-talk switch of my microphone to return his call. I mean, after all, that *is* the HT that I talk to the local hams on. Can those really be signals from space coming on the very same radio? But wait, I've *got* to return the call. He won't be in there very long.

I scampered up the ladder to the loft in the A-frame where the other radio gear was. It was nothing fancy, but I was going to at least try to get my own signal back to the space shuttle. "W5LFL, this is W8FK calling, Whiskey Eight Foxtrot Kilowatt portable in the central Colorado Rocky Mountains." I don't believe this. I'm actually trying to talk to a man in outer space. I must be crazy. This is something that would be happening in those comic books I used to read as a kid. And here in my own lifetime I'm actually attempting to communicate with a spaceship?!

Hey, no time to think about that now. Even if I'm dreaming, it won't last very long. Better go for it.

I started to hear his voice even louder than before on his second transmission. "This is W5LFL aboard the space shuttle *Columbia* passing over the polar ice cap and listening for amateur-radio stations in North America. Go ahead, over." Got to start calling again. Let's see, Art and Ken are on those frequencies. Oh yes, here's my channel. The local hams were trying to spread out over 10 calling channels so we would have a better chance of one of us getting through to the shuttle. But can this really be happening? He's so far out there that maybe his signal is being received by a station in some other solar system. Got to quit thinking about that now. I've got to start calling again. "W5LFL, this is W8FK in Colorado."

I wonder if I've got a chance to get through. I mean it's only 10 Watts and a ground plane. But at least it's worth trying. I know Ken WØLSD is trying also. It's too bad about the cloud cover tonight. Skip W9GYA and I were going to try a makeshift tracking station. He was going to fire up his 160-Watt mobile installation and I was going to be the human tracking station. We figured with my 11-element beam attached to a broomstick and me standing on a stepladder pointing the antenna at the spacecraft as it went over, that Skip's 160 Watts would give us a real good erp and we might have a good chance of getting in.

But as luck would have it, our normal "banana-belt-of-Colorado" weather had turned to solid overcast this particular evening. (Is that guy's name Murphy? Who invited him anyway?) It looked like we wouldn't be able to see the shuttle tonight. We had been getting our share of the white stuff this winter and the Colorado ski areas were in their best shape for early December in many years. But unfortunately, I wasn't too impressed with it snowing this particular night (even though I had already been on those funny boards a dozen times and loved every minute of it). Just the night before, we had been outside looking for the shuttle and hoping to hear it as well. And sure enough, there went the brightest looking "star" in the sky overhead at a great rate of speed through a large hole in the clouds. It appeared right on time from the mountainous northwest horizon and sped high overhead, disappearing on the southeast horizon a mere few minutes later. That in itself was a real adrenaline rush, just watching those guys in space going over. But tonight we were actually hearing them, and even though the weather had clouded our plans to use the high-powered station with a moderately-sized tracking array (with that li'l ol' tracking facility—me), we were all bound and determined to try communicating with the first ham in spaceflight history.

So anyway, I had to overcome my rambling mind and concentrate on the task at hand. As Owen started to fade a bit on his third and final transmission of this orbit, I thought I would tune the channels that the earthbound hams were calling Owen on. Holy mackerel—every frequency was loaded with hams! Both Jack NØCDA and Art had done the same thing. We all heard some of the most exciting QRM ever to hit our eardrums. There were stations booming through on every channel.

Normally we don't hear much 2-meter activity up our way. We are located in the Upper Arkansas River Valley about 120 miles southwest of Denver and 90 miles west of Colorado Springs. There are a few hams between those front-range cities and our 8000-foot-high valley, but there are many mountains in between us to block the signals of the city hams from us. And over the Continental Divide and west to Aspen are all those 14,000-foot mountaintops of the Collegiate Peaks range, so there just doesn't seem to be any way that many signals can reach us from those population centers. But tonight we are hearing stations from all over. Several of the calls we located in the *Callbook* and tracked down later. One guy, Rod WØHON, actually was in Aurora, Colorado (a suburb

of Denver), over 100 miles away through the mountain peaks using only 10 Watts. We have trouble hearing the repeaters down there, let alone a little station. What kind of conditions are these that put so many strong signals into our area? Are all the city hams up in the high country for the weekend to increase their chances of contacting the shuttle? Is the spacecraft causing an atmospheric disturbance? Jack and Art compiled the following partial list of callsigns heard during those hectic moments of shuttle calling, with their home QTHs and approximate distances through the rugged Colorado high country from Buena Vista: NØAWD, Pueblo, 100 miles; KØILS, Littleton, 90 miles, NØBIB, Canon City, 70 miles; WA3CVC and NØERO, Florissant, 50 miles; WØSG, Englewood, 90 miles; and KAØPMT, Westcliff, 60 miles. What kind of stations were those guys using anyway?

Well, it sounds like Owen has faded from range. A look at the clock shows about 6 minutes have elapsed since I heard that first break of the squelch on the HT down in the kitchen. Wow, seems like 6 days with all that excitement packed into that short time. Better get on the local 146.745 machine and see how the others heard him. Talk about a double! This was a "quadruple!" I heard everyone on there at one time. There was NØCDA, W9GYA, KCØVL, and WØLSD almost simultaneously on the local machine. I tell you, as busy as we hams are during the week, it's seldom that all 5 of us are on at one time, but the space shuttle made it a special time. Everyone was so excited about hearing the signals. Something like this really brings out the little kid in you no matter what your age, and you should have heard the five 30- to 60-year-old little kids on the repeater now. The excitement level was running high.

"Yeah, Barb and I had to excuse ourselves from our host and hostess to go out to the car and listen to the shuttle," said Ken, who had been invited to dinner that night. Art and XYL Edith were inviting everyone over for happy hour, they were so excited. Skip and son Michael had hurried out of the local shoe store to try to make the schedule. Jack and XYL Alberta were at their home at the base of Mount Antero, and my dog Ali and I were near the repeater site at the base of another 14,000-foot peak, Mount Princeton. It sounded like a bunch of school kids who had had their first taste of ham radio all over again. What a fun time! The local frequency buzzed for quite a while. Ken and Barb had to get back to their host and hostess before they were thought to be too crazy, having rushed out into the cold Colorado night for what? To talk to a spaceship? *Right!* Edith finally understood why Art had been acting so weird earlier. I mean to say, the man had the window open all day for antenna-wire-stringing and this is wintertime in the high country. And Skip is used to talking and listening to aircraft in his job as a pilot for United Airlines, but this was a little bit higher control-tower-in-the-sky talking than usual. And where were all those stations coming from anyway that Jack and the rest of us heard on the uplink frequencies? Was that some strange propagation because the spacecraft was flying through the outer fringes of the Earth's atmosphere? We're still not sure why they were so strong in our area. We'll have to try to work those guys later for comparison.

Terry Huston, his HT, and 14,197-foot Mount Princeton in the background along with the Upper Arkansas River Valley.

After the initial shock wore off, we set about trying to talk to Owen on more of the passes. Somewhere along the line, Skip and I got the bright idea that just possibly a modulated F2 CW signal might get through over the thousands of voices calling. It was a real sight to see us holding a microphone in front of the code-practice oscillator with one hand while running the Morse-code key with the other hand. Who says CW isn't useful anymore?

Later in the week I had to ask a patient of mine if he would mind if I interrupted our eye examination to try to talk to outer space. I really expected a very strange look, but it turned out that the patient sitting in my chair was an SWL named Jerry. He had heard all the publicity about the event from the TV but didn't know where to set his scanner to receive Owen. So we hustled into the lab area of my office and grabbed the HT off the countertop and sure enough, Jerry got an earful of the astronaut as he flew across the daytime sky. We called again with the HT and telescoping 5/8-wave whip on a hope and a prayer that we would be heard. Imagine the thrill for some of the guys down on Earth as Owen repeated back a few of the callsigns that he could sort out from the thousands of hams calling him. A few lucky guys were actually hearing their own callsigns being acknowledged from outer space—right then and there. I would have had to be sitting down to take that if I had heard my own call. SWL Jerry was quite excited just to have heard the shuttle on that tiny HT.

As far as publicity for the event, our little group did alright. Ken took his HT down to the Buena Vista Middle School where Barb is a teacher and let her class hear the shuttle on one of the passes as he tried to call back to Owen. Skip recorded one of the passes and made the feature news for the rest of the day with the subsequent interview on the local KVRH radio station serving Salida and Buena Vista. He also sent a tape of one of Owen's transmissions along with his wife Kathy to the elementary school class she teaches in Salida. I wrote an article for the local newspaper and they printed it in the next issue, complete with a photograph taken by Art's XYL Edith. It was even "stop the presses" because I turned the article in as soon as I could but beyond the normal deadline for printing, but they thought it was important enough and timely enough to get in the next issue.

It was truly a remarkable event for our little group of hams. We're still trying to make schedules with some of the many stations that

✓See List of Advertisers on page 114

were heard on the calling frequencies to see if there was some special propagation during those days of shuttle flight, or if it could be an everyday occurrence if those antennas were pointed our way more often. Or does it have something to do with the adrenaline rush of hearing a spaceship that makes our radios get a little more excited and put out better? I'll bet it has to do with the same feeling as seeing ol' Saint Nick and his reindeer and sleigh, flying over the nighttime sky, delivering his payload to the world.

At any rate, what us "kids" experienced during those attempted QSOs is a feeling that none of us will ever forget. This was truly a pioneering event that will go down in recorded history for a long time to remember—the very first exchange of amateur-radio signals between human beings on Earth and outer space. I know for the 5 "kids" of Chaffee County, Colorado, it will be a lifelong memory and another bond in the truly fascinating world of ham radio. Amateur radio strikes our lives again!

KB6WT, KD6YG

Jon J. Gallo KB6WT
Jo Ann Gallo KD6YG
17540 Margate Street
Encino CA 91316

It all began when Bill Pasternak WA6ITF, publisher of Westlink and a *73* correspondent, telephoned to confirm that the flight of STS-9 is a go. We discuss antennas and decide to run comparisons between my OSCAR array 15 feet above the roof and an AEA Isopole at 105 feet. I'll be running 75 Watts. Bill asks whether my QTH would be available for some publicity shots for the local TV stations. I check with the XYL, KD6YG, and reply that both of us are willing to help. This is Monday, November 21, 8:00 pm.

Tuesday, November 22, 7:30 am

The morning drive to the office through the typical Los Angeles traffic jam on the San Diego Freeway. I sign on to the local 220-MHz repeater and am called by Roy Neal K6DUE of NBC. After discussing a holiday party at my QTH that Roy and his XYL will be attending, he mentions that he has talked to WA6ITF about the publicity shots and either he or Bill will be back in touch.

Saturday, November 26, 11:00 pm

KD6YG and I return from Thanksgiving vacation and find messages on the answering machine from both WA6ITF and Jack Burnett of *73*. Bill confirms that at least one local TV station wants to tape at our QTH on the first day W5LFL will be operating. Jack has left a message asking me to call him at home Sunday morning.

Sunday, November 27, 7:57 am

Jack Burnett calls to see if I would keep a diary of my experiences attempting to work Owen. KD6YG, who likes to sleep late on weekends, turns over in the waterbed and mutters something about cancelling our subscription to *73*. I go to the shack at the other end of the house and agree to take part in a conference call at 1 pm. The next step is to load Wordstar into the Apple II+ and start this diary.

Sunday, November 27, 1:00 pm

Conference call with Jack, Bill, and other hams from Indiana, Illinois, Alaska, Michigan, Hawaii, New York, Oregon, Texas, Ohio, and Georgia. WA6ITF goes over Owen's transmit and receive frequencies. Two audio tapes are played, one containing orbital information almost too fast to copy and the other an interview of W5LFL by Roy Neal.

Burnett explains that *73* wants a completely honest diary of our attempts to reach Owen and asks each of us to mail the diary to him on the evening of December 6, the last day in orbit. With Owen only having time for 400 or so QSOs, I'll have about 1 chance in 10,000 of getting through. The statistics remind me of some famous 20-meter pileups.

The call ends with a tribute by Jack Burnett to Peter O'Dell of the League for his work on the ham-in-space program and the sad news that Vic Clark W4KFC has died of a heart attack.

Monday, November 28, 7:00 am

Struggle out of bed and scan the two morning papers we have delivered daily. Both contain stories about Owen and both report the possibility that the flight will be delayed because of bad weather. I brew a cup of coffee and turn on the KA6DMY 220-MHz repeater and am reassured by the familiar "hollow" sound of the countdown being rebroadcast from the Jet Propulsion Lab repeater in Pasadena. The Apple II+ is turned on and loaded with Wordstar to continue the diary when I realize the countdown is at 10 seconds. A quick dash to the family room where I dispossess my 13-year-old son from early morning cartoons and turn to NBC where we watch the lift-off and listen to the familiar voice of Roy Neal.

Monday, November 28, 4 pm

My secretary interrupts a meeting to advise that KCOP, local channel 13, is on the phone. The person phoning doesn't seem to know much about amateur radio. We arrange to have them stop by to tape orbit 40D at 6:31 pm local time on Wednesday. They never show up or call back.

Monday, November 28, 7:45 pm

The night news producer for KTTV, local channel 11, calls. She stresses she has been reading the ARRL press releases and understands amateur radio is far different from CB. We tentatively arrange to have the crew come at 10 am on Wednesday for a live shot of orbit 35A, the first orbit over the western US.

Tuesday, November 29, all day

The phone has been ringing off the hook all day. Lenore Jenson W6NAZ, an expert in amateur-radio publicity, has given my name to a number of TV stations. KTTV calls to advise they will be out by 9 am tomorrow. CBS New York calls to tentatively schedule coverage for orbit 40D. The local ABC affiliate calls for an advance interview and will be out at 8:30 this evening.

I call Lenore to bring her up to date on the publicity schedule and spend the next hour in a round robin of calls with Lenore and Bill Pasternak attempting to determine whether Owen will be available for orbit 35A. The final decision is that it is a 50-50 tossup. KD6YG announces she is getting out of this madhouse for the evening and goes to a movie with girl friends.

I tune across two meters and find 145.550 MHz congested with catcalls and unidentified stations pretending they are the shuttle. Good grief! Is this what W5LFL is going to encounter?

Tuesday, November 29, 8:30 pm

I check into the AMSAT net for the latest orbital predictions. The crew from the local ABC affiliate arrives early and tapes for about 15 minutes. It is going to be cut to about a 45-second teaser for the late evening news. The interview ranges from the technical to personal observations on my excitement over the possibility of working the shuttle. The interviewer keeps asking what we expect to learn from operating the shuttle and I express the opinion that we are going to end up knowing more about low-power Earth-to-space communications than ever before. I wonder what they are going to leave in.

For a few minutes I check into the Southern California DX Club repeater and find nothing but discussions about the shuttle mixed with an anonymous voice using a southern accent and CB lingo pretending to talk to Owen. Anxiety over intentional interference increases.

Tuesday, November 29, 11:10 pm

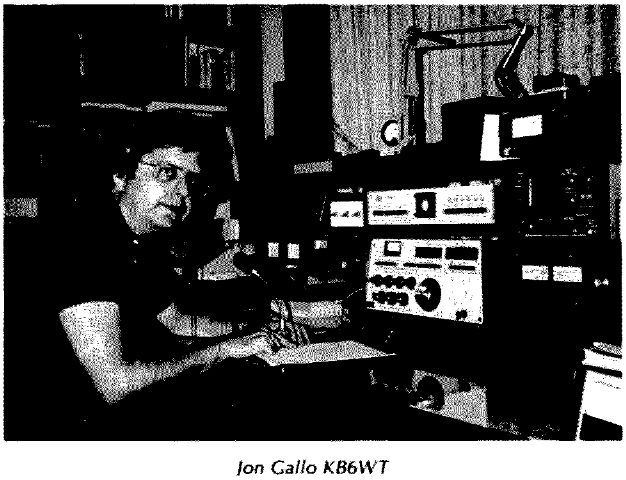
ABC airs about one minute of the interview stressing my personal excitement over attempting to work Owen. A few minutes later the phone rings and the caller, in a slow and somewhat "spaced out" voice, identifies himself as Mike and asks if I was the person in the interview. When I hesitantly admit my involvement, he says he is a 32-year-old Vietnam veteran and father of a 5-year-old girl and is tired of all the negative news reports on TV and wants to thank me for doing something that brings some good news to TV. In a state of semi-shock, I tell him I never expected such a call and appreciate the nice comment. We wish each other good night and I go to bed to prepare for what is beginning to look like tomorrow's ordeal with the media.

Wednesday, November 30, 7:00 am

I check into the Southern California DX Club repeater and find discussions of orbits mixed with DX announcements. Two of the locals mention being contacted by CBS and ABC for taping at their QTHs. Maybe I'll only have to deal with the two local stations today.

Wednesday, November 30, 9:30 am

The KTTV crew arrives and sets up for live coverage of orbit 35. KD6YG handles the calling and I'm in charge of azimuth and elevation controls. We are using 145.01 as the transmit frequency and 75 Watts to the KLM 144-150-16C circularly-polarized antenna. 145.550 is a madhouse, with stations calling Owen,



Jon Gallo KB6WT

policemen adding to the confusion by telling them to QSY, and a fair amount of deliberate interference. A great deal of the problem is attributable to the fact that one of the major daily newspapers in Los Angeles published a detailed article about W5LFL that reversed the uplink and downlink frequencies! Numerous amateurs will be calling on the uplink for several days as a result of this error. I do not hear W5LFL but am later informed on one repeater that the pass was successful and Owen was heard listing various W7s and on another that he was involved in a science experiment and never got on! KTTV tapes part of the pass and then conducts a 2-minute live interview that goes well. I pour myself a well-earned cup of coffee, put on a tie, and go to the office for a few hours.

Wednesday, November 30, 5:30 pm

The KABC crew arrives for a live feed of orbit 40. The operating plan this time is to use 145.01 at 6:35, 145.03 at 6:37, 145.05 at 6:39, 145.07 at 6:41, and back to 145.01 at 6:43. Power level will remain at 75 Watts. I spend about an hour on 145.550 simplex providing pass times and orbital data to stations needing this information. During the pass I was able to hear W5LFL quite well during three of the five minutes he was scheduled to transmit during the window. There was some intentional interference, but less than during orbit 35. However, there was a great deal of calling on the uplink and many policemen. I was unable to determine whether we got through. I deliberately use earphones so that the audio is not picked up by the TV crew. I subsequently find that other amateurs participating in live coverage provided complete audio and at least one local newspaper runs a first-page story stressing deliberate interference.

Thursday, December 1, 7:30 am

I check into the early morning AMSAT net and determine that orbit 49 will not be workable from Los Angeles. I leave for work without trying.

Thursday, December 1, 5:00 pm

Driving home from work, I monitor 145.550 MHz and listen to N6VI and WB7AIC acting as net-control stations and giving out information on orbit 56. A pattern seems to be forming. A good 95% of the amateurs on 145.550 appreciate this information. The remaining 5% are extremely negative and keep suggesting, often obscenely, that stations providing this information QSY. I am acquainted with several of the amateurs making negative comments and know them to be old-timers in their 60s or above and licensed for many decades.

Thursday, December 1, 6:24 pm

Signal acquisition on orbit 56 is loud and clear. I am operating alone this time and am using 145.01

Jo Ann Gallo KD6YC

MHz as the uplink. W5LFL is acquired during the last ten seconds of his 6:26 transmission. The 6:28 transmission is S9 with only one local policeman breaking in for a quick comment to someone he hears but I don't and about 5 seconds of interference. The 6:30 transmission starts out above S9 but can be read for only 10 seconds when a WB6 begins calling him on 145.550 and the rest of the pass is lost in the resulting exchange of insults and comments by channel cops. Comparing notes after the pass, it appears that even in QRM-free areas, loss of signal occurred in less than 2 minutes of good quality shuttle audio. My reception seemed significantly better than that obtained by many users of local repeaters and I spend much of the evening replaying the usable portions of the tape for local amateurs.

Friday, December 2, 6:00 pm

Driving home, I am informed that Owen was an S7 on orbit 71. I try on orbit 72 and W5LFL appears to be a no-show. Intentional interference on this orbit is worse than last night. I am later informed that Owen was on, but the attitude of the shuttle resulted in the antenna not being properly oriented for good reception in Los Angeles.

Saturday, December 3, 1:00 pm

Roy Neal calls from Houston to report that the shuttle mission is being extended an additional day. We compare notes about forthcoming orbits. Roy reports being able to receive Owen 5 × 9 using a handheld and rubber duckie in his hotel room in Houston. We agree that small antennas are best for receiving purposes in areas of high population density in order to minimize interference. I subsequently call Jack Burnett at his home to confirm the extra day of operation.

Sunday, December 4, 8:00 am

I check into the Southern California DX Club repeater and get orbital data for 98A. This time I decide to listen to all ten uplink frequencies before deciding on my transmit frequency. Feeling somewhat suicidal, I decide to disassemble my Icom 271A and install a newly purchased ac power supply in order to reduce the load on my 35-Amp dc power supply. More as a tribute to Icom than to my mechanical skills, the entire job is accomplished in minutes and works perfectly.

The pass begins with AOS scheduled for 1630 UTC in Los Angeles. A quick scan of the uplink frequencies shows slightly less rf on 145.03. There is less malicious interference than ever before and the number of policmen is also reduced. Unfortunately, W5LFL again appears to be a no-show. Comparing notes with local amateurs after the pass, no one heard Owen. The consensus is that the confusion is being reduced, but no one knows what to do about the channel cops.

Roy Neal calls from Houston at 9:45 am and plays the audio tape of the W5LFL/JY1 QSO. It was a pleasure to listen to a QRM-free pass. As a member of the DX Club subsequently states, a jammer in Jordan is likely to get more than his coax cut off!

Sunday, December 4, 6:00 pm

Conference call with *73* and the participating amateurs. We share our experiences, frustrations, and hopes. Parts of the country have had no success, while others, such as the northwest and south, have done very well. We go into a great deal of detail on antennas and press coverage and make final arrangements for submission of our diaries.

Sunday, December 4, 8:00 pm

My schedule suggests that I'll miss both orbits 114 and 119 tomorrow. KD6YC agrees to try to contact W5LFL. I check into the local AMSAT net to get orbital parameters and we jointly go over azimuth and elevation settings for each minute of both passes to make certain that Jo Ann is prepared.

Monday, December 5, 7:00 am

I drive off for my first meeting of the day and leave the station (and Apple II+) to KD6YC.

Monday, December 5, 8:19 am

I (KD6YC) finally get a solo chance at Owen on orbit 114. KB6WT goes to work and our 13-year-old leaves for school. Hoping the doorbell and telephone don't start ringing (I turn on the answering machine so I'll have some control over the situation), I turn on the gear and double-check the schedule. When the clock ticks to the right time, I jump in. While continuously repeating my callsign, I turn on the tape recorder, adjust the azimuth and elevation, and watch the clock. All goes well. The only sound I hear is someone saying, "He is talking to Houston." It would have been great to hear Owen. I plan my schedule for the day so I'll be at the radio to try again on the 4:08 pm pass.

Monday, December 5, 4:00 pm

Unfortunately, I (KB6WT) sneak out of the office early to be home for orbit 119. Once again W5LFL is a no-show. I heard very few calls to Owen on the uplink. Intentional interference probably amounted to no more than 30 seconds during the entire pass. Los Angeles seems to be getting its act together. (I find myself wondering whether Los Angeles has an undeserved reputation for poor operating. According to the 1983 *Callbook*, we account for 13% of all the amateurs in the country and a quarter of them live in L.A. That's about equal to the amateur population of such states as Massachusetts, New Jersey, Michigan, or Illinois!)

Tuesday, December 6, 8:00 am

KD6YC back at the Apple. The OM has to be at the office all day, so I get the shack all to myself for both orbits 130 and 135. I arrange for someone else to drive the carpool so I can be at the radio at 8:06 to try to reach Owen. It's exciting when I hear his voice acknowledging sixes "too numerous to write down." He is torn between the ham rig and the window—the view of California is fantastic, he says. Even listening to Owen Garriott call CQ from the spaceship *Columbia* is an incredible experience. Being the positive thinker that I am, I hope to hear my callsign acknowledged by Owen—what a thrill that would be.

Tuesday, December 6, 3:55 pm

My son, Don, is standing by to answer the telephone and the door if necessary so I won't be interrupted for these few precious minutes during orbit 135. This time the plan is to call for approximately 5 seconds on each uplink frequency. Now I find myself controlling azimuth and elevation, the tape recorder, 10 different transmit frequencies, and checking the clock all at the same time. I always said I

liked being able to do two things at once, but this is ridiculous! When Owen comes back after the second or third transmission, I'm pretty sure I hear Kilo Delta Six Yankee something. Did he say "Yankee Gulf"? Has he heard me? I glance at the tape recorder and realize that in all the confusion I had forgotton to turn it on. Now I have no way to double-check to be sure. I'm so frustrated! I could scream! I hope they hurry up with that official list of callsigns heard—the suspense is killing me.

Tuesday, December 6, 8:00 pm

KB6WT back at the diary. I check into the AMSAT net and obtain data for orbits 146 and 151, which are the only two likely passes over the west coast on Wednesday. If Owen is operating, the chances of getting through are likely the best yet since information on these orbits has not been given widespread publicity. Checking into the DX Club repeater, I find out that one local confirmed W5LFL using 160 Watts and a pair of KLM CP beams. That's only 6 dB more gain than I have available with 75 Watts and a single beam. Playing back the tape of today's two passes, it appears that there was no intentional interference on orbit 130 and less than 30 seconds of such interference on afternoon orbit 135. Also, the callers on the downlink and channel cops were less numerous.

Wednesday, December 7, 7:53 am

Owen shows up about two minutes later than predicted by the AMSAT net and is 60 dB over 9 while he announces he is over San Francisco. He acknowledges numerous sixes and fades out abruptly about two minutes in advance of expected LOS. The rapid fade is confirmed by several other amateurs in Los Angeles.

Wednesday, December 7, 3:41 pm

KD6YC back at the Apple. Well, here I am again, one more time, one final try to communicate with a fellow ham in space. I've gotten the system down pretty good. I'm very busy, but I sense after my first or second transmission that he isn't there and he isn't going to be there. You just know he's gone. I got a true feeling of how vast space really is. Well, Owen, it's been fun. We'll have to do it again sometime. See you in the newspapers.

Wednesday, December 7, 6:30 pm

With both the flight of STS-9 and this diary drawing to a close, some final thoughts seem to be in order.

The entire experience has been perhaps the high point of more than two decades of involvement in amateur radio. If I had to summarize it in two words, they would be "fun" and "fatigue."

In retrospect, the interference was much less than I expected and decreased dramatically with each pass.

Replaying the tapes of Owen's passes reveals that intentional interference accounted for less than 10% of the total interference I encountered. Calling Owen on the downlink accounted for another 30% or so. More than half the interference was the result of channel cops. Instead of a short transmission advising the offender that he was on the downlink, many policemen found it necessary to be both abusive and long-winded.

Attempting to work the shuttle as it approaches both AOS and LOS points is actually nothing more than a form of VHF weak-signal work. When attempting to pull a signal out of the noise level, a competing VHF signal many miles away renders the attempt impossible. If I could offer a single piece of advice based on this experience, it would be to stay off of the downlink for at least 10 minutes before and after AOS and LOS at any particular QTH. The mere fact that we have lost the shuttle in Los Angeles does not mean that we can start rag-chewing on the downlink. We will probably be interfering with another station some distance away at a better location or with better antennas.

I sure hope the ARRL releases a complete list of calls tape-recorded by Owen in the near future. The suspense is killing me!

Jon Gallo KB6WT is 41 and a partner in a large Los Angeles law firm where he specializes in estate planning and probate administration. Jo Ann Calio KD6YC is 38 and considering re-entering the job market now that the children are teenagers. They have been married 19 years and have a son aged 13 and a daughter aged 16. Both hold Advanced-class licenses. Jon has been licensed for 21 years and Jo Ann for 2 years.

Jo Ann's hobbies include photography and needlepoint. Jon's include photography, cabinet-making, and target-shooting.

Jon has been involved in amateur-radio-related legal problems on a voluntary basis for several years and is currently the president of a large UHF-oriented radio club in Los Angeles.

For the low bands, the shack consists of a Signal One 1030 transceiver, J.W. Miller automatic antenna tuner, and Henry 2K-4 amplifier. Antennas include two elements on 40 meters at 95 feet, a KLM KT34XA tribander at 80 feet, and a coaxial dipole for 75–80 meters. VHF interests extend from 144 MHz to 450 MHz.

For the STS-9 mission, the gear consisted of an Icom 271A multi-mode transceiver, a circularly-polarized 14-element beam with azimuth and elevation controls at 30 feet, and an AEA Isopole at 105 feet. The CP beam consistently outperformed the Isopole for reception. A Mirage B108 amplifier with built-in preamplifier was used on all passes.

KZ7T

Randy Stimson KZ7T
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Jimmy Hollister, a radio personality from one of the leading radio stations in Portland, KEX-AM, said on the air just now (7:00 am, July 21, 1983) that he had heard there was going to be a ham aboard the space shuttle *Columbia* and asked if anybody knew about it. I was reluctant to talk to him, but my wife, Lorna Campbell KA7RFD, called him and handed me the telephone. One of the reasons that I went ahead was that I had just returned from a ham fair in Spokane, Washington, where Roy Neal from NBC was the speaker, so I did have some knowledge about the operation of the ham-radio person on the shuttle. During our conversation he asked if I would be willing to come to the KEX station, hook up my gear, and try to contact Owen Garriott live. I agreed to do so.

August 12: Realizing that I would need help technically and otherwise, I contacted Stan Griffiths W7NI, owner of Antronics of Oregon. Stan agreed to be the second member of the team. I talked to Stan about people who could help us technically with the antennas and other related gear. He suggested Lynn Hurd WB7UNU, so I contacted him. He agreed to help out, and all three of us decided we would set up our gear at KEX Radio. We did a lot of reading and research, looking up all the information we could find on the best type of antenna, and finally agreed upon the turnstile-type antenna which produces a circularly-polarized signal.

August 22: KEX said they had an engineer who was a ham, Michael Brown N7AXC, and Mike became the fourth member of the team. He was a great asset to us as not only could we now readily obtain access to the KEX roof and studios, but he knew the correct media personnel to contact.

August 25: Telephoned Peter O'Dell of the ARRL to request press releases and U-Matic tape.

August 27: Lynn WB7UNU and I built the first antenna. We used 1 × 2s, chicken wire, 2 × 2s, and 1/8" brass brazing rod, using RG-58 and RG-59 coax and using the proper heights from the ground plane. We referred to the *ARRL Antenna Book*. We had a very difficult time as we couldn't get it tuned to where we wanted it. The swr was running at 1.8-1.9 and it didn't seem to make any difference how much we changed the 1/8 rod. We decided to enlarge the size by using 1/4" copper tubing over it so we could slide it in and out. We got some of the swr readings down as low as 1.2-1.3 and it was a lot better. We tuned the first antenna.

September 3: I built the other four antennas but did not final tune them.

October 3: We realized we would need some press releases to come from KEX and would need

✓See List of Advertisers on page 114

someone to help us write them. H. Lea T. Ball AL7W agreed to be our press-release person and the fifth member of our team. We met together on two occasions to draft and finalize the press release, but on October 24, just before we sent it out, we heard that the shuttle flight for October 28 was cancelled and everything was put on hold.

November 15: Received audio tape from the ARRL and updated press kits. Realizing that all of a sudden it was upon us again, I contacted Mike N7AXC and we put the whole operation back into motion.

November 21: I began to gather up all of the equipment necessary to make this work. The equipment consisted of two 7850 Kenwoods, one 7950 Kenwood, one Icom IC-211, and one Yaesu FT-726R. The power supplies were one KPS 12 Kenwood, two Astron RS 35As, and one Astron RS 20A. We had the two Kenwood 7850s running at 40 W each, the Kenwood 7950 had a 160-W Mirage B3016 amplifier on it, the Icom IC-211 had a 160-W Mirage B3016 amplifier, and the Yaesu FT-726R also had a Mirage B3016 160-W amplifier. We were running three stations at 160 W each and two stations at 40–45 W, whichever the 7850 Kenwoods put out. We used the Yaesu for the primary receiver and also for recording and the Kenwood 7950 as a backup recorder.

From this point on, there were a lot of meetings discussing how we would approach the transmission. We decided that on the first odd minute we would use the first five uplink frequencies, the second odd minute the second five uplink frequencies, and if time permitted, we would revert to the original five uplink frequencies, and so on. We hoped this way we might make contact. We originally thought about all five people using all five callsigns, but decided against that primarily because if W5LFL heard one call, we thought probably he would then switch channels. We decided each would use his own call.

We sent press releases to AP and UPI, all TV stations, and the local newspaper. (We did not send to the local radio stations as we were operating from a radio station.) We had some response, and TV stations did ask for a press conference which we set up for November 25.

November 24: We set up all our gear in KEX's lobby. The antennas were placed 18' apart on the roof and were tuned. We marked everything with a number. Each coax, antenna, and rig was marked with the same number so that when we re-installed the equipment we didn't have to worry about the swr. (This was necessary as we were unable to leave our gear—apart from the antennas on the roof—at the KEX station.) We used RG-11 coax cable for the feed and had trouble getting the longest piece, 94', below an swr of 1.8 no matter what we did, so we decided we had to live with it. The shorter pieces came down to a 1.2 level. On the 25th, we put all the equipment back up and at 10 am PST we had our first TV news conference with KATU (ABC) and KPTV (independent). At this time, KOIN-TV called and said they had not gotten the information regarding the press conference and asked if we could hold another on November 27. We finished the press conference and tore all the equipment down again. (Up it went again on the 27th for the CBS KOIN-TV conference.)

Shirley Hancock of KOIN-TV interviews Randy KZ7T.

November 26: We put up the dish at Antronics of Oregon so that we could monitor NASA; we began monitoring the next day. From that point on, Pat Griffiths, wife of Stan W7NI, monitored it almost continually for us for any updates or changes. Later she also monitored W5RRR and we kept in constant telephone communication with her.

November 28: We had another meeting to figure out a better way to make contact with Owen, but we again agreed that the idea of single calls per person and on groups of five channels at a time, one channel per station, transmitting on the odd minute, was still the best way to operate. We also agreed to make only three attempts from KEX—orbits 39D and 40D on Wednesday, November 30, orbit 71D on Friday, December 2, and orbit 119D on Monday, December 5.

November 30: Our first contact. The first time we heard W5LFL we heard him acknowledge Lance Collister WA1JXN in Frenchtown, Montana, at 6:34 pm PST, orbit 40D. We had at KEX Radio all four local TV stations, KATU (ABC), KOIN-TV (CBS), KGW (NBC), and KPTV (independent). *The Oregonian* (newspaper) was there and also a reporter from KLCC who drove up from Eugene, Oregon. We were told we were on national television on NBC. Walt Morey WA7SDY, a good friend, videotaped all the events, including the coverage by the news media. Sherill Smith KA7KNG was of great help assembling and disassembling the gear on all three occasions.

December 1: Stayed home that night and heard Owen at 6:22 pm PST.

December 2: Mike N7AXC was unable to be present due to a prior commitment with jury duty, so Sherill KA7KNG became the fifth operator. Made our second contact from KEX at 4:40 pm PST. We think W5LFL may have heard W7NI who, on the last minute of our transmission, decided to change his method and switch from channel 1 to channel 2 after giving his call a few times. Owen said he had heard W7 with two other letters, switching from channel to channel, and would verify when he got back to NASA.

December 5: I had a live interview on KXL-AM radio in Portland at 2:15 pm which lasted about 10 minutes. We set up our gear for our third and final attempt for KEX. The pass was 119D. It was slated to start here at 4:07 pm PST. We started on the uplink on the same frequencies we had previously used. We tried at 4:07, heard nothing at 4:08, transmitted again at 4:09, again heard nothing, so we tried something brand new. We had two Morsematics, one an MM2, and we programmed all six operators' calls into memory. We included the call of Sherill KA7KNG as he had been our fifth operator on Friday night and was present again tonight. On the odd minute of 4:13 pm, we transmitted all calls—Morse code at 25 wpm. We did it twice. Six calls at 25 wpm took 17 seconds, then we went back to voice and we listened for the even minute. At 4:15, we did it again with CW, listened for the next minute, and then went back to straight voice. We figured if anything could have got through the QRM, it would have been Morse code. If anyone else had known about it, it wouldn't have worked at all, so we kept very quiet about our plan. This was our kicker. Unfortunately, we don't even know if Owen had his rig on. We were hoping that he would respond that he had heard Morse code. We could have tried this Friday night, but then we felt Monday would have been a disaster as everyone would have been trying. But it was a good trick and we used it as our final, desperate attempt. We had no contact with W5LFL, but we did have with us two television stations (KATU and KGW). We had excellent coverage from the news media throughout. We pulled up and separated our gear, each taking home an antenna and a large piece of coax as well as our own gear.

Special acknowledgements: Patricia Griffiths for her behind-the-scenes work; my wife, Lorna Campbell, spent endless hours helping me out, writing this report, taking telephone messages, driving around town getting things done; Sherill Smith, who did all the still photography and masses of the legwork; and, of course, KEX Radio in Portland. Without them, we wouldn't have had this coverage, and the KEX staff worked with us in a magnificent fashion.

W7NI Comments

I have been asked for an opinion as to the overall result we had here and what we might have done better. We did our part fairly well. As a matter of fact, I can't think of anything I would do differently with the exception of possibly running much higher power, since, as far as I know, the only people who got through were running considerably higher power to considerably better antennas which had the ability to track the shuttle automatically. That seems the way to get through.

As it is in virtually any other highly competitive activity, and this appears to be no exception, indeed, good sportsmanship doesn't reign. Wish it did! Sorry, but I don't think it does.

It probably would have been better if they had put the thing on a different frequency like 220 Megahertz instead of 2 meters and a different mode, CW say, instead of FM, something where there is some operator skill involved. A means, in a way, of weeding out some of the interference and some of the QRM. I really don't know what's going to happen next time they put one up. If they don't go to an odd frequency, if they remain on 2 meters, I think you'll see (you think it was chaotic this time!) a great deal more chaos next time because there will be a great deal more power on. We've sort of proven this time that high power gets through. It appears the moonbouncers were making it and there'll probably be a huge upsurge in powerful amplifiers in the next one. I think what we need is a 100-dB attenuator on the receiver.

AL7W Comments

My feeling on this whole experience with STS-9 is that those who made the decision to use frequency-modulated voice need to rethink the process. In a crowded band condition, which is all that could realistically be expected, all that discriminator in Owen's receiver is going to hear is a lot of noise with the exception of people who used their EME rigs and antennas. I am really disappointed in that decision. It would have meant a great deal more expense for myself to work him, but it would also have increased my chances to work him if we had used single sideband, or whatever. CW, of course, would have been the ideal mode since that is not only Owen's pet mode, but mine also. I find the idea of working him was great; I just question the wisdom of using FM and I also question, to a certain extent, the wisdom of using the 2-meter band.

WB7UNU Comments

I think that the experiment was a good one, but I hope in the future they use a frequency other than the most populated ham band so as to further the hobby by the expansion of user use on to the less used bands such as 220 or 450. People who use these frequencies are more serious about long distance. We also need better prior communication. It seemed anyone who had a radio added to the havoc, especially those people who knew nothing about it until the last minute and therefore transmitted on a downlink and on the even minute. All they knew was that there was a pass going over, and they pulled every dusty radio out of the closet and turned it on.

It would have been nice also to know those who had previously been contacted so as to remove them from the list of those attempting to contact the shuttle, such as the kilowatt moonbouncer station which was, at least in our opinion, desensitizing the receiver to the point that low-power operators were completely removed from the input of the radio. Hopefully, there will be some design changes on the next radio, whenever that may be, so that he can switch on attenuation to reduce that kind of effect.

I would like to see some way information could be exchanged between the voice link, between the shuttle and NASA, such as we see on SATCOM 1R which we are now allowed to watch and even rebroadcast. If there were some sort of key or indication that he was into that part of the activity, then we would have a little better indication what was going on.

Again, better communications. I called Westlink at 10 pm PST on Monday, December 5, and listened to a recording that gave the orbits for Friday, Saturday, and Sunday which had all passed. The indication on the tape was that it would be changed on Monday afternoon, but apparently that never occurred.

Antennas on the KEX roof.

KZ7T Comments

The hams got better and better as time went by. I did one thing on December 5, five minutes before Owen was even thinking about coming over Portland during orbit 119. I got on 5.550 on the odd minute and talked to all hams with 160-W power, reminding everyone to "check your clock, check your time, make sure you transmit on the odd minute, try not to transmit on the even minute, and remember politeness." I also said that two television stations were standing behind me with their mikes stuck into my speakers, so let's be a little careful what happens. That night was super; nothing but politeness, so we are learning how to handle this thing.

There is a lot of comment about forms other than VHF. There's talk about single sideband, 220, 440, HF, and every time you bring up one of these, it's fine if you have the gear, but a lot of people can't afford single sideband or 220 or 440, so I don't think that's the answer.

THE OREGONIAN, SATU

5 hams bone up for space

Radio operators target astronaut

Keeping their fingers crossed will be a key element in the strategy of five Portland-area amateur radio operators who hope to chat with an astronaut in space Wednesday evening.

Randy A. Stimson, H. Lea T. Ball, Michael D. Brown, Stanley A. Griffiths and Lynn C. Hurd, besides relying on the good-luck ploy, also will be using the latest equipment in a large, jointly operating base station. Their aim is to communicate with the space shuttle Columbia, scheduled for launch Monday.

Astronaut Owen Garriott, a ham radio buff, will be using a hand-held walkie-talkie to talk to Earth during his off-duty hours. He will be the first astronaut allowed to pursue his radio hobby from space through non-NASA channels.

Garriott, a mission specialist, will be working inside Spacelab, which the Columbia will be carrying it in its cargo bay.

Stimson of 9890 S.W. Inglewood St., Ball of 3945 S.E. Cora St., Brown of 3740 S.W. Comus St., Griffiths of Aloha, and Hurd of 4880 S.W. 195th Court have set up a group amateur radio operation at the KEX studios in Portland. The idea was hatched by station broadcaster Jimmy Hollister during one of his morning shows and he broadcast an appeal to ham operators in the area.

Brown is a KEX engineer with his own amateur radio station. The others also have ham stations.

"I think we have at least one chance in 25 of being heard by Garriott," Brown said. "We're hoping we have superior equipment over some of the other amateurs" who will try the same thing.

Stimson estimated that there are 4,000 to 5,000 hams within a 100-mile radius of Portland, 7,000 to 8,000 in the Seattle area and 2,000 to 3,000 in the Spokane area. As a result, the air waves likely will be busy with calls to the astronaut, Stimson said.

The best times to talk to Garriot from the Northwest will be when he is closest to overhead. Provided the Columbia is launched on schedule, it should be near, although 175 miles up, between 5 and 5:30 p.m. Wednesday, from 4:30 to 4:55 p.m. Dec. 2, from 4:07 to 4:20 p.m. Dec. 5 and from 3:45 to 4:07 p.m. Dec. 8.

Anyone with a programmable radio scanner should be able to pick up the broadcasts from space. Garriott is expected to be transmitting at 145.55 megahertz using call letters W5LFL.

Persons who do receive him and can verify it can obtain a card with his call letters by writing the American Radio Relay League-STS-9, 225 Main St., Newington, Conn., 06111.

Stimson suggested that, in sending for the card, the application should state the time, frequency and a brief outline of what the astronaut said.

Persons desiring the latest information on the frequency over which Garriot will broadcast can call 1-800-SCANNER.

Once again, persons around the world can use the telephone to listen to the astronauts and keep abreast of the flight.

Callers in the United States can utilize Dial-A-Shuttle by dialing 900-410-6272 to hear the astronauts live when they are in touch with mission control. When the shuttle is out of range, National Space Institute personnel will update callers on the status of the flight, the next expected communication time, and educational features about the trip.

Callers from the United States will be charged 50 cents for the first minute and 35 cents per additional minute.

Dick Powers WB7ADM, in Portland, had probably one of the best answers. A lottery system where all the hams could send in their calls if they would like to contact the next ham in space and, if nothing else, arbitrarily, or by computer, pull out so many calls for an area and they would be called from the space shuttle down to Earth. If they were listening, they could acknowledge. I'm positive we would get many more contacts. If a ham tried to jam on the uplink, he would be notified he was not being accepted, because it was not working. Those who acknowledged their callsign would get a QSL card.

I cannot believe W5LFL just had batteries and wasn't plugged into a power supply with limitless power—that's hard for me to understand.

I don't feel any magazine, *73*, *QST*, or any magazine, had enough articles prior to the event to help the hams figure out what was going on. I would have liked to know a lot more about the gear Owen was using. Could he hear on 55? How long can it last? What kind of reception was he getting? We don't feel he was getting good reception or that his receiver was that good, but we don't know. Could the magazines send newsletters out? If I belonged to the ARRL, I should receive a newsletter from them. If I subscribed to *73*, I should have gotten a newsletter from them. Hams in the area were asking us questions we knew nothing about and I probably had as much information as anyone in the area as I called the ARRL and got the press releases and the U-matic tapes, and I also heard Roy Neal speak in Spokane.

It seemed to be a feeble attempt. A lot of guys spent thousands of hours, not to mention money, for a feeble attempt and I don't think that's right. I feel that 2 meters is probably as good a mode as any. Some people think CW is the answer, probably because they are good at CW, but there are many hams who don't use CW. I think this mode was a good one.

When the news media first approached us and we had the first interviews, we stressed that our only goals were to hear Owen Garriott and to further the cause of ham radio. We told them this was the first time a civilian ham had been able to listen outside of NASA. We told them ham radio was fun; we like to see how far we can talk and get a QSL card back. We tried during every interview to make it seem like fun. We had positive feedback from everyone because we did hear Owen Garriott and we did fulfill our commitment.

Randy Stimson KZ7T, aged 57, is married to Lorna Campbell. He has three children from a previous marriage, all married, with six grandchildren among them. Born in Seattle, he has spent practically all his life in the tire in-

dustry, where he started during high school busting tires for a tire shop. He spent 20 years selling equipment, but now also does service, troubleshooting, and PR work. His territory covers eastern Oregon, Washington, Idaho, and western Montana. He has been a ham for three years and prefers the community-service side to the DXing. During the past year he was part of the communications group for the Kidney Association of Oregon Keg Roll, the Portland Rose Festival, two Sports Car Association of America Rallies, and several Bike-A-Thons. He belongs to the ARRL, the Oregon Tualatin Valley Amateur Radio Club, the Portland Amateur Radio Club, the Inland Empire VHF Radio Amateurs, the American Radio Relay Group, the NW Repeater Group, the 10-10 Club, and ARES. His wife, Lorna, is very active in a non-academic sorority group which encourages friendship among women and service to those less fortunate than themselves. They like to travel and try to visit Lorna's homeland (England) about every three years, usually combining the trip with one to another European country.

N7AXC

Michael D. Brown N7AXC
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The morning DJ at KEX Radio, Portland, Oregon (where I am employed as an engineer), mentioned on July 21st Owen Garriott's planned attempts at ham-radio contacts with Earth-bound hams on the next shuttle flight. Through the DJ (Jim Hollister) and News Director Jim Howe, I was forwarded a few inquiries from local hams. I first made land-line contact with Ronald W. Magnus WA7GFE, Portland, and Ron and I were in contact several times by phone and at least once in person.

It was Hollister's wish that we attempt to set up a base station in the KEX studios so that we might have the attempt to broadcast the contacts, if not live, at least on tape shortly after the contacts. It was also my feeling that the KEX studios would provide a good central location for staff and interested listeners, as well as for the media, to witness the event. Ron was very helpful in providing me with preliminary information, including orbital maps, but was of the opinion that our location hugging a hill to the west would make the KEX site less than ideal for many if not most of the orbits.

Then Randy Stimson KZ7T and I first made telephone contact. We had a comedy of errors in missing each other's phone calls up to this time. I learned that Randy, along with Stan Griffiths W7NI and Lynn Hurd WB7UNU, had already been working on the project, after talking with Jimmy Hollister. Randy was of the opinion that we would be able to make adequate contact most of the time from the KEX studio location and convinced me of its advantageous location, for the above stated reasons. Upon closer examination of the orbital maps and some rough calculations as to the effects of the hill on our potential-contact windows, I agreed to work with them in putting on a large, jointly-operated base station at the KEX studios.

My special assignment was to interface with KEX and the media. We needed a location in the building (which was not easy, since all the available accesses to the roof came to locations far from any room in the building we could potentially use). We needed ap-

NEWS RELEASE

FOR RELEASE 10 AM 11-25-83

CONTACTS: RANDY STIMSON KZ7T 233-8545 297-1175;
H. LEA T. BALL AL7W 777-1032 775-0188;
MICHAEL BROWN N7AXC 225-1190 245-4889.

For the first time in history, private citizens will have a chance to talk directly to a man in space. Astronaut Dr. Owen Garriott, callsign W5LFL, will be talking to amateur (ham)-radio operators throughout the world while on board the STS-9 space-shuttle flight. The shuttle is due to blast off next Monday, November 28. Garriott, a NASA mission specialist, will use a low-power hand-held FM transceiver to make his contacts during his off-duty hours. He will be the first astronaut allowed to communicate with Earth through non-NASA channels.

The exact time of our attempted contacts with Dr. Garriott is not confirmed at this time, but will likely be between 5 and 8 pm, Wednesday, November 30.

The idea of setting up a group amateur-radio operation was conceived by KEX Radio morning personality, Jimmy Hollister, during one of his shows. He broadcast an appeal to ham-radio operators in the area. Five area hams, including KEX engineer Michael Brown, have arranged for a large, jointly-operating base station to be run from the KEX studios. (All the equipment involved will be set up and operating for the November 25 News Conference.)

Original proposals to place an amateur-radio transceiver aboard an orbiting US spacecraft surfaced when NASA was about to launch *Skylab*, in the early 70s. The plan was rejected because it came too late in the development of the program.

Space-shuttle flights presented another opportunity. The American Radio Relay League (ARRL) and the Radio Amateur Satellite Corp. (AMSAT) jointly requested that Garriott be allowed to operate a small transceiver aboard the shuttle. NASA accepted, on the stipulation that the plan would not interfere with mission activities and that safety regulations were met. The radio will be operated from the aft flight deck of the space-shuttle orbiter, *Columbia*, which is carrying the Spacelab in its cargo bay.

The KEX team news release.

See List of Advertisers on page 114

provals from management, programming, engineering, and other parties within the station. I began working on these decisions and approvals.

Over the next few weeks, we worked out all the problems of press releases, locations, and equipment. I got clearance for, and made arrangements for us to set up in, a portion of KEX's large front lobby. Ac power for our 5 rigs and associated equipment was to be run off two isolated circuits of 20-Amp capacity each. All equipment would be set up on neatly draped tables in the lobby and would be removed, for security purposes, between each contact session. Five antennas built by Stimson and Lynn Hurd WB7UNU would be placed on the roof of the building and held down with bricks. RG-11 lead-ins would have to be brought in through an ajar front door and rolled up and stored on the roof between contact sessions.

At that time, we also planned to set up a satellite dish monitoring NASA video and audio off SATCOM 1R. The dish was to be on a trailer, in the KEX parking lot. (It was later set up elsewhere.) I would rewrite a final draft of the news release, write up a news conference notice, and mail all materials to all local television and daily newspaper outlets. I would also contact all these media by telephone to personally invite them and answer any of their questions.

On November 24, we set up all gear in the KEX lobby for a dry run and antenna tuning. All equipment and coaxes were numbered, to speed up future setups. Everything had a place and a number. The 5 antennas were set up on the flat roof. We communicated from the roof to the lobby via 2 meters, as we tuned up the antennas' active elements for lowest vswr. The best antenna tuned up to 1.2:1, while the worst was about 1.85:1. That antenna also had the longest RG-11 lead-in—some 94 feet. (Please refer to Randy Stimson's diary for a rundown of the equipment used.) In addition to what he mentioned, we wired a Sony TC-92 cassette recorder into the Yaesu FT-726R for taping all receptions.

We set up all equipment again for the 10 am news conference on November 25. In attendance was KATU-2 and KPTV-12. Randy and I had rehearsed and planned a formal statement followed by a question and answer session. All TV stations preferred to go "by the seat of their pants" with a more informal approach. Both KATU and KPTV did major stories on us on their evening newscasts. On the 27th, we re-assembled all equipment for another arranged news conference with KOIN TV-6. They ran an excellent story on us that evenng.

On November 30, we heard Owen Garriott, with readability of poor to fair and signal strength of fair. Heard him for a portion of 1834 PST, all of 1836, and part of 1838. KATU, KGW, KOIN, and KPTV, which constitutes *all local TV stations with news departments(!)*, were there to cover the event. All ran excellent stories that night. We were on live, in one case, and were the lead story in another case. (Note: TV stations usually do a *live* news story only for what they consider to be very major events.) *The Oregonian* (the only major daily in Portland), with statewide distribution, also covered the story, as did KLCC radio in Eugene (some 120 miles away). KXL and KYXI radio also had stories prior to the contact session, even though we had not mailed any materials to any other radio stations. KEX played back the tape of Garriott on the evening talk show, "Northwest at Night," and ran several news stories on the contact that evening and the next morning. The KEX switchboard received numerous phone calls on the subject, mostly for information. We pushed the 1-800-SCANNER number and gave them the downlink frequency. Jimmy Hollister and the other KEX DJs were talking about the reception of Garriott all day, December 1, and played the tape of the reception during their shows.

Stimson heard Garriott when at his home at 1822 PST, with good readability and good to very good signal strength. A tape of the reception was run on KEX that evening.

No response was ever heard to our call letters from Garriott except probably once. On December 2, Owen acknowledged W7 and "2 other designators" he was not sure of. Stan Griffiths (of our group) is W7NI. Garriott said he would check his tape later to try to identify the W7 call.

Michael Brown, 31, has been involved in broadcast radio for 9 years. He currently serves as Radio Engineer for KEX. Married with one stepchild, he's an avid backpacker, skier, Sierra Club member, and musician.

Call to shuttle goes unanswered

By TERRY CARR
Daily News reporter

From 5:15 p.m. until 5:32 p.m. Wednesday, Allen Bianco filled every odd-numbered minute with letters, numbers and pleadings.

"W5LFL, W5LFL, space shuttle Columbia, this is KL7FKO. KL7 Fox Kilo Oscar, Anchorage, Alaska, calling W5LFL, space shuttle Columbia. Come in W5LFL," he said over and over again into his ham radio handset.

Nine times he repeated the call and nine times he got no response from the shuttle, which was somewhere 120 miles above Alaska and traveling at 10,500 mph.

"Here I've got the newspaper here and the guy doesn't want to say anything. Come on Garriott, say something," Bianco said after one attempt.

He stared at the tiny, silent speaker that was supposed to pick up the response from Dr. Owen Garriott, an amateur radio buff and one of two mission specialists aboard the space shuttle.

Bianco, a 52-year-old retired Anchorage policeman, is one of 13 ham radio operators in the United States chosen by "73" magazine to attempt to talk to Columbia during its nine-day flight. It is the first space flight during which communication with amateur radio operators is planned.

Before the shuttle returns Tuesday, Bianco will have seven more chances or "windows" when Columbia will be positioned in the right place above Alaska to hear him calling. The windows will vary in length from 13 to 30 minutes.

The procedure calls for him to broadcast on odd-numbered minutes, and allow the even-numbered minutes for Garriott's response.

The shuttle's antennas must be pointed toward Earth and Garriott must be awake and off-duty before the link can be made.

"I don't know what happened," Bianco said after Wednesday's window closed without contact with Columbia. "I will be talking to NASA tomorrow. I want to know if he was asleep and if I'm wasting my time. But I'm not disappointed. I enjoy it very much. I'm not giving up."

United Press International reported

See Page B-2, HAM

KL7FKO

Allen Bianco KL7FKO
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Anchorage AK 99511

The following is a diary of my experiences while attempting to contact W5LFL aboard the space shuttle *Columbia*.

Orbit 56D. Started to call at 17:15 Yukon Standard Time. *Anchorage Daily News* photographer Paul Brown and reporter were present. Transmissions were made at 17:15/17/19/21/23/27/29/31. No contact.

Orbit 72D. Started to call at 17:10 YST. Channel 2 (KTUU) present with reporter Geri de Hoog and cameraman Barry. At 17:14+, *heard the call of W5LF- without* the L almost immediately following my call. This signal was not strong at all and was in the noise; however, I don't think that this was a reply. The receive frequency was 145.550 MHz. I logged this as a no contact—could be a ham somewhere far from Anchorage. Transmissions made at 17:11/13/15/17/19/21/23/25 YST. No contact.

On that same night, I heard comments from Australian hams complaining that the windows were wrong. A friend of mine heard the same comments on HF and reported that to me the next day.

December 2. There are no windows today. However, the receivers were constantly on and the recorder was ready. A ham reported to me that Kenai (60 miles from Anchorage) heard the word "Columbia." I think this was just interference or some other ham calling. Called Jack Burnett, Executive Editor of *73*.

Orbit 98A. Started to call at 7:30 YST. Transmissions were made at 7:31/33/35/37/39. I made a mistake and also transmitted at 7:42 (after the window). No contact.

Orbit 114A. Started to call at 7:15 YST. Transmissions were made at 7:15/17/19/21/23/25/27. Following the last transmission at 7:27, I heard and recorded on tape what appeared to be "KL7F- Anchorage, Alaska," and "AGG." The transmission was cutting off and was barely above the squelch. I got a little shook up and transmitted a few times even though the window was supposedly closed. I now have my doubts about the windows and the times. Next window is at 15:07. I then left the house and had a friend of mine listen to the tape but he could not make it out. While there I received a phone call from Jack Burnett at 13:55 YST advising me of a conference call at 17:00 YST.

Orbit 119D. Started to call at 15:07/09/11/13/15/17/19. No contact. Conference call started at 16:57 and ended at approximately 18:25.

Orbit 130A. Started to call at 7:11/13/15/17/19 YST and continued for 3 more transmissions even though window was closed. No contact.

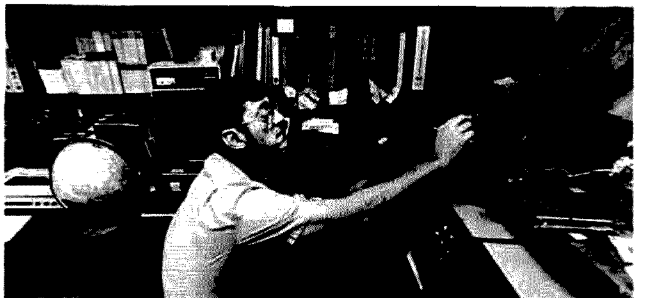
Orbit 132D. Even though that part of Canada was not supposed to be on my schedule, I transmitted at 10:01/03/05/07/09 YST. No contact.

Orbit 134D. I experienced QRM on 145.550 MHz from a local ham and I told him to get off the frequency. Transmitted at 13:19/21/23/25/27/29/31/33/35/37/41/43/45/46/49/51/55 YST. No contact.

Orbit 135D. No-QRM transmissions made at 14:45/47/49/51/53/55/57/59. I stopped. No contact.

My transmitter was a Yaesu 221R with a 10-element beam at 63 feet. My receivers were an Icom IC-290A scanning 145.530/550/570 with a 5/8 whip at 41 feet, a Yaesu 207R scanning 145.530/550/570 with a rubber duckie, and a Tempo FMP 203 at 145.550 MHz with a 5/8 whip at 22 feet.

I transmitted and listened and transmitted and listened and I real-



Allen Bianco KL7FKO tunes his equipment to the shuttle frequency.

ly don't know if he heard me or whether he acknowledged. But I did not give up. I was frustrated but I never gave up. Perhaps the next time the shuttle goes up, I will be able to tell everybody in town that I in fact did talk to it. The *Anchorage Daily News* came in and excitedly waited for Garriott to say something. KTUU (Channel 2) did the same. Radio Station KFQD was on the phone at the close of the windows. People I never knew called me and asked for the frequencies. I broadcast many a QST on two meters and read the windows. I borrowed another two-meter rig, an Icom IC-290A, so I could further monitor, and I didn't talk to Garriott. But that's OK. Perhaps he was asleep or busy or the shuttle ham antenna was facing the stars when it was passing over or near Alaska. But I will not give up. I will try again.

This is Allen Bianco KL7FKO, the Alaskan who enjoys life and his hobby.

Originally an Israeli, KL7FKO is a 52-year-old retired Anchorage policeman and the former owner of a color processing lab. In addition to ham radio, Allen and his wife, Debbie KL7GIS, enjoy traveling. Son Michael is studying for his ticket.

KH6B

Dean Manley KH6B
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Here is my account of the STS-9/W5LFL mission, as viewed from Hawaii. On November 27, I participated in a teleconference call with Jack Burnett of *73*. This was like an hour pep-talk to live and breathe the STS-9 mission for the next few days. However, it seemed that there was little hope to hear W5LFL, let alone work him, from Hawaii. There were no scheduled active orbital passes over or near Hawaii.

In order to get a better overview of the orbital ground tracks of *Columbia*, a sine-wave curve was drawn on one of the plastic overlays of "The DX Edge." With this device and the given active passes, it became clear that some of the daily passes would come close to Hawaii even though W5LFL would be busy at work or would be fast asleep. The following is the log of the attempts.

November 28: *Columbia* STS-9/W5LFL lift-off as scheduled at 6:00 am Hawaii time. Listened to W5RRR, Johnson Space Center, and obtained info on W5LFL operation.

November 29: Listened to media coverage to determine if W5LFL operations would begin. Some confusion on the part of some radio stations when converting UTC to local times on the mainland. And further confusion when converting times to local time in Hawaii!

November 30: Orbit 35, 8:43 am—tried listening and transmitting with a hand-held (Ten-Tec 2591). Results: negative. Orbit 36, 10:05-10:14 am, Hawaii time, again same procedure as above from a downtown Hilo parking lot. Results: negative. Numerous attempts to call Westlink to get recorded message of latest info drew a blank—line was always busy. Dialed the ARRL number and got their recorded info which was essentially the same as info before the mission started. Orbit 42, 7:35-7:46 pm, close to Hawaii, but negative results using fixed station IC-290H/Isopole antenna.

December 1: Orbit 52, 9:56-10:04 am, and orbit 59, 8:58-9:06 pm. Both negative results. Started construction of a turnstile antenna for 2 meters. Used parts from 2 yagi beams for 2 meters.

December 2: Orbit 69, 11:14-11:20 am, and orbit 75, 8:43-8:52 pm. Both negative results in Hawaii. Used both the hand-held plus fixed-station equipment.

December 3: An attempt to get additional orbital information from W5RRR failed due to poor band conditions and QRM. Westlink number was again busy. Telephoned the ARRL and got the recording of orbital passes. Was pleased to see additional passes added to the list of pre-mission info. Also learned that NASA had extended the mission one extra day. It started to look somewhat better!

Finished building turnstile antenna with tuned reflectors. Swr of 1.06 to 1 with the antenna mounted on the back-porch railing using a clamp and a bracket method of mounting.

December 4: Orbit 99, 6:23-6:32 am using IC-290H/turnstile and reflectors. Negative results. Participated in teleconference call number 2, 4:00-5:30 pm. Much valuable info was shared among all participants. Also the fact that W5LFL should be on the air much of Wednesday and Thursday. I was hoping that this meant that Hawaii would somehow be included in the activity! Orbit 106, 6:50-7:02 pm. Negative results.

December 5: Orbit 120, 3:41-3:52 pm, negative results but now keeping better records—separate log sheets for each orbital pass plus a note as to starting the magnetic recorders. Yes, I wasn't about to miss any possible activity with just one recorder! Orbit 121, 5:09-5:20 pm. Negative results. Orbit 122, 6:38-6:50 pm. Results negative.

December 6: Orbit 137, 7:28-7:36 am. Negative results. Orbit 132, 9:00-9:12 am. I didn't take part in this one. This was an active orbit scheduled for Canada. Learned via Juan KH6JJC that KH6ENC club station manned by KH6F was thought to have completed a 2-way with W5LFL. This was not confirmed as reception of *Columbia* was very marginal at best as it was practically on or beyond the horizon. Orbit 137, 4:58-5:08 pm. Negative results. Orbit 138, 6:27-6:38 pm. Also negative results. On these two attempts, used 7290 kHz as sort of an intercom (outer-com?) with Juan KH6JJC on Kauai and Larry AH6EQ on Oahu to compare and exchange notes.

December 7: Orbit 147, 7:19-7:28 am. Negative results. Orbit 148, 8:47-8:55 am. I did not monitor the orbit as it was during working hours for me. Also learned ahead of time that this pass would not be a good one for us. This info via KH6JJC and apparently coming from the NASA Tracking Station at Kokee, Kauai, Hawaii. This was the pass over Hawaii that W5LFL was heard calling KH6HA several times. According to the stations reporting the incident, it sounded like a scheduled event. This could have been confirmation of perhaps yet another 2-way in the Hawaiian Islands! Orbit 153, 4:43-4:52 pm. Negative results on perhaps the last of the good orbital passes over the islands. Orbit 154, 6:17-6:24 pm. Last chance even though the pass was very low to the horizon. I used the Isopole antenna instead of the turnstile to get the signal down towards the horizon. Again, negative results. Compared results and notes with KH6CC, KH6S, and KH6IJC on 7290 kHz. It was noted on several occasions that there was visual contact with the *Columbia* with a corresponding negative radio QSO! The experience was great, and with such experience, perhaps the next attempt will be fruitful! Aloha from the 50th state, Hawaii!

Dean Manley KH6B

Dean Manley is a 51-year-old Extra-class licensee who resides in Hilo, Hawaii, with his wife and two daughters. He is a machinist-technician, International Typographical Union, with the Hawaii Tribune-Herald, *and also is self-employed as a consultant in broadcast radio, FCC applications, etc. Dean has owned radio stations in Michigan, New Mexico, and Hawaii, and also is a published writer (his "Putting the HW-12 on 160" appeared in 73 many years ago).*

KH6HHM

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The shuttle flight is over but not forgotten. We were unsuccessful in making contact with Owen Garriott as he passed McKinley High School and the island of Oahu in the Pacific, but the excitement and anticipation of the possible QSO with W5LFL was felt by all the members of McKinley High School's Amateur Radio Club (KH6NF) and by other students on campus. For the students handling the equipment and those responsible for tracking the shuttle using the Apple computer, this was especially true. Everyone felt confident that they were doing their jobs correctly as several dry runs had been performed and it looked A-OK. As the shuttle passed by the islands time after time, it was a letdown for the students not to be successful in making contact after all of their hard work and dreams.

Back in September, at the start of the school year, when the club members heard about the shuttle and the possibility of having a QSO with W5LFL, everyone wanted to give it a try. It would be a new experience for everyone, as no one thought he would ever have a chance to talk to an astronaut.

Everyone started gathering as much information about the shuttle flight as they could find and also information about the antenna system needed to reach the shuttle. We had an Apple computer to use, so part of our research was to find a way of using it for tracking the shuttle and perhaps even controlling our antenna as the shuttle passed overhead.

Gathering the materials for the antenna system wasn't hard once

the decision was made that we would try our luck using a quad. In fact, just for luck, we would build a 2-element quad and if we needed a little more gain, a 4-element quad would be built and placed side by side. Afterwards, we could always put them to use, and building the antennas, tuning, and comparing their performance would be a learning experience for everyone.

We decided to use our old 32-foot Tri-Ex crank-up tower that a few years ago became a 16-footer during a windstorm. It was still in good shape after it made a trip to the metal shop to get a few spots welded and a new base plate made. For antenna control, we had available two light-duty rotors, one for bearing and the other mounted horizontally for vertical control.

Material for the quads would be PVC pipe and wooden dowels for spacers, with copper wire for the elements. Building the antennas went smoothly as we used plans and measurements from the *ARRL Antenna Book*. We had some problems getting the swr down to 1 to 1, and we had to unsolder the elements, replace them, and tune them one by one to keep the swr low.

Once that problem was solved, we looked at the best method of mounting them to our boom. This gave us our biggest headache because our antennas were of different size and weight. We also weren't sure if our rotor could handle the weight for our vertical control. This turned out to be our problem. Because the two antennas were of different size and weight, there existed an unbalance and our small light-weight rotor couldn't handle the difference in weight. We had control for only a few degrees and couldn't get the antenna to point directly overhead.

So it was back to the drawing board for a new design and equal distribution of weight on the rotor. After a few hours of experimenting, we solved the weight problem by making both antennas the same weight and mounting them as if they were both 4-element quads. We made the 2-element quad heavier by extending the PVC pipe behind the reflector and balancing it with an iron rod from the metal shop. Once the antennas were balanced, our problems were solved and they worked perfectly.

While the antenna problems were being solved, another group of students was in the process of getting the Apple computer to track the shuttle. This was completed at about the same time the antenna was completed and everyone felt they were ready, willing, and able for their first QSO with outer space. Our idea of using the Apple for control of the antenna had to be postponed for a later project due to time and availability of components, but it's just a matter of time and money.

It is hoped that the next flight of the shuttle will have a beacon so that at least the students will be able to hear it and know that they are doing something right. It is also hoped that Hawaii will be on the schedule of future flights where it will be possible to have a QSO with the shuttle. It's not too encouraging to know that perhaps a contact will be possible if there's any extra operating time.

The students were disappointed that no contact was made with the shuttle, but all felt the effort was worthwhile and all are looking towards the next opportunity for the Radio Club at McKinley High School (KH6NF) to have a QSO with a being in outer space.

Allan Chun WH6AVH and Dean Takamatsu make final adjustments on the shuttle/satellite antenna system located on the roof of the electronics and club station.

Chun Kit (Vincent) Lui putting the finishing touches on the tracking program using an Apple II+ computer.

SOME FINAL THOUGHTS...

Each of the foregoing diaries is a story in itself. On behalf of the staff and management of *73*, I wish to express to each writer our appreciation for taking on the added burden of documenting his own personal story as it unfolded. It's rare that people like this are brought together in such a way; each is well worthy of special praise.

While in the area of giving thanks, there are a number of others who must be mentioned. First, Owen Garriott W5LFL himself, the man who had the dream, worked at making it a reality, and then lived it with and for us.

Then, our good friend, NBC News Correspondent Roy Neal K6DUE. Someday the whole story of Roy's involvement will be told, but for now, it's safe to say that were it not for K6DUE, the STS-9 ham-in-space operation might never have gotten off the ground. Roy did far more than document the flight in "Amateur Radio's Newest Frontier" and file reports for NBC. For over a decade he lived Owen's dream with him and helped W5LFL become the world's first astro-ham.

To Peter O'Dell KB1N of the ARRL, there is no way to express our gratitude. Most of you are not aware that Peter regularly held teleconference meetings with every publisher in the amateur-radio field interested in reporting STS-9 ham-in-space events. Peter insisted that everyone have the same information as the ARRL was given—and have it quickly. For the past few months, KB1N was STS-9 at ARRL headquarters. He literally lived on a telephone 10 to 15 hours a day, flew to meetings in Houston, and spent the flight at Mission Control away from his family. Peter O'Dell is a dedicated and warm human being who deserves our collective thanks for keeping the needed information flow going at all times and keeping it as accurate and up-to-date as possible.

A word here also about NASA's Administrator, General James Abrahamson. He's not a ham . . . not yet, anyway. But General Abrahamson did recognize the value of experimenting with amateur radio from the shuttle and was the man who signed the papers welcoming amateur radio on the orbiter.

Finally, League President Victor C. Clark W4KFC. In our book, Vic was one of the best things ever to happen to the ARRL. He brought new meaning to that organization and was the person responsible for bringing the League into Owen's corner when he most needed its assistance. Vic's eyes would literally light up with pride every time he talked about STS-9, Owen Garriott W5LFL, and the ham-in-space operation. Sadly, Vic suffered a massive heart attack and died less than 2 days before STS-9 blasted into orbit from launch pad 39 at the Kennedy Space Center. He never lived to see or hear the dream of Owen Garriott—the dream he shared with Owen and countless others—become reality. Victor C. Clark W4KFC lived for and loved amateur radio. He lived and worked to better it worldwide. Vic was the "ham's ham," and it is to his loving memory that we have all dedicated this special report.—WA6ITF.■

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Switch Tricks

Ever had trouble setting up switching? No more. The Minnetonka Master makes it easy.

Here are two no-nonsense approaches to switch-circuit design that anyone can use to advantage. With these methods, you will be able to draw a practical switch-circuit diagram for almost any switch-based idea you can dream up. The first is called the "Floating Circuits" method because parts of the circuit are disconnected and are floating free when they are not in use. The second is called the "Common Bus" method because in the early stages of the design process a bus (a set of connection strips or tie-points) is used.

Let's take a practical example of a switching-circuit design problem and solve it by both methods. I recently purchased a nice set of high-impedance headphones without cord or plug from a manufacturer's surplus store. To decide on what sort of plug and cord should be wired in, I looked over the various pieces of equipment where my new bargain could be put to use. It was obvious from the variety that I really needed several configurations of cord and plug, not just one.

It occurred to me then that it would be handy to be able to change the wiring of the phone cord from a stereo to a monophonic configuration without having to rewire or use an adapter. Moreover, it would be even handier to be able to transpose left and right when in the stereo mode and to change from parallel to series when in the monophonic mode. If one could just *switch* between these four functions, it would permit the use of the same pair of phones in several different applications. If all this complex switching could be done with just one switch, I'd have a foxy piece of equipment. How many times have you found yourself in this situation, but were stymied by your inability to convert your wiring concept into an electronic circuit?

This is a typical switching problem and one that lends itself well to solution by the Floating Circuits and the Common Bus approaches. With a little patience and practice, you can be designing fairly complex switching circuits simply by following a few easy steps.

1) Find a quiet spot where you can think with no interruptions. Arm yourself with a few pencils, a pad of paper, and an eraser. (There are old-timers who claim that after the brain, the eraser is the circuit designer's most important tool.)

2) So that you can have a convenient overview for reference and comparison, sketch, on a single page of paper, the circuits of each of the functions to be included in the new device. In our headphone example, there are (A) Stereo Normal, (B) Stereo Reversed, (C) Mono Parallel, and (D) Mono Series. Draw these circuits as if they were hard-wired for a single function, as in Fig. 1. Our goal will be to interconnect these four circuits with a single multi-pole, multi-throw switch.

3) Take a fresh page and, using the whole page to provide plenty of working room, sketch in the components to be worked with. In this case, the components are: the right earphone, the left earphone, the three-wire phone cord, and the phone plug. Since the switching obviously is to occur between the ends of the three-wire cord as the input terminals and the four connections to the two earphones as the output terminals, a fair amount of blank space should be left between input and output for circuit development. (See Fig. 2.)

4) Now two simple rules for adding the switching can be applied:

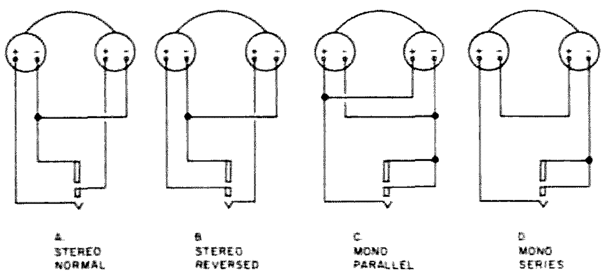

Fig. 1. Sketches of all circuits desired.

(a) Always connect each input terminal and each output terminal to the movable arm (called the wiper, blade, or pole) of a switch symbol, and give each a number for convenience of location. (The example has seven such terminals, numbered from 1 through 7.)

(b) For each switch arm, sketch in as many contacts (throws) as there are functions desired, and identify each with the letter corresponding to the function circuits you drew in your Fig. 1. Keep the same sequence from left to right in each switch set. (The example has four functions, so each switch assembly will have contacts A, B, C, and D.)

When you have gotten this far, your sketch will resemble Fig. 3 and you are ready to start drawing in the function circuits of Fig. 1. To familiarize you with the techniques, these circuits will be "wired" to the proper switch contacts first by the Floating Circuits method and then by the Common Bus method since often it is possible to gain additional advantages by evaluating both approaches.

5) In the Floating Circuit method, a single circuit and a single set of contacts are dealt with at a time until all four circuits have been connected. Begin with the circuit for function A and each switch assembly's contact A. Start with the input connections. Sketch in circuit A, connecting the input contacts 5A, 6A, and 7A to the appropriate inputs of the circuit, and then sketch in the output connections to 1A, 2A, 3A, and 4A. When this is done and checked, sketch in circuit B, making the proper connections to all seven contact Bs. Do the same for circuits C and D. With all four circuits drawn in, it will resemble Fig. 4.

Note that when all seven switch arms are swung to contact A simultaneously, circuit A alone connects input to output. When all seven switch arms are swung to contact B simultaneously, circuit B alone connects input to output, and so forth. Switches whose arms are connected mechanically so that they all may be swung simultaneously to a specific set of contacts are said to be "ganged." This is usually represented in a diagram by a dotted line. In the switching diagram you have just designed, every circuit except the one in use floats completely free of electrical connection to the working circuit. In certain rf applications (such as bandswitch circuits), this can be a desirable characteristic.

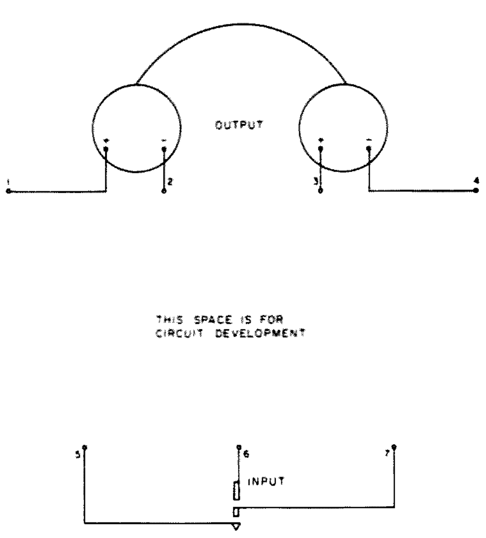

Fig. 2. Sketch of components needed for circuits.

6) The Common Bus method will now be applied to solve the same problem in hopes of obtaining some simplification advantages. Taking a fresh page of paper, redraw Fig. 3 leaving plenty of room for circuit development. Sketch in a horizontal bus whose number of parallel elements is equal to the largest number of terminals in either the input or output. The example has a three-terminal input and a four-terminal output, so the bus will have 4 parallel elements. These are represented schematically as four parallel lines. Your sketch should look like Fig. 5.

7) Sketch function A's circuit between the contact As of all seven switch assemblies. (Such circuits are made easy to sketch by thinking of the bus elements as a convenient set of tie points.) Starting at the end of the circuit with the least terminals, in this example the input, connect each input switch contact A (5A, 6A, 7A) to a separate element of the bus. To complete the circuit, it is necessary only to connect the output contact As each to the proper bus. Check the work against A in Fig. 1 to ensure correctness.

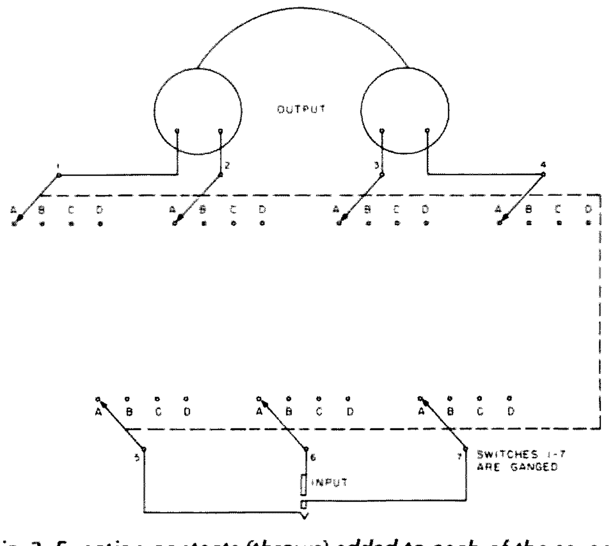

Fig. 3. Function contacts (throws) added to each of the seven terminals.

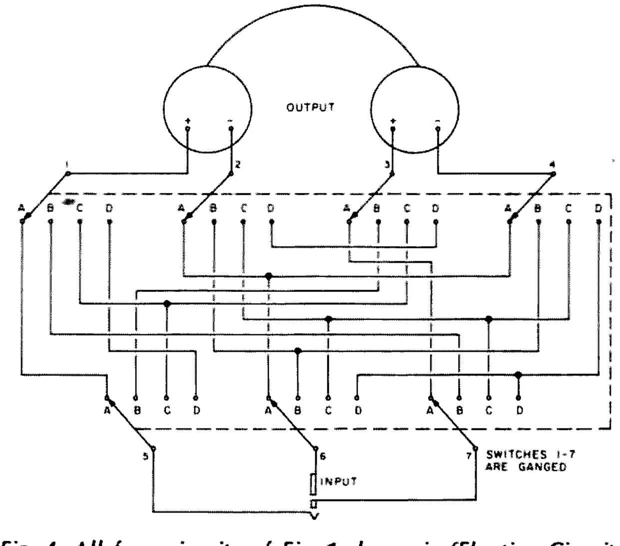

Fig. 4. All four circuits of Fig. 1 drawn in (Floating Circuits method).

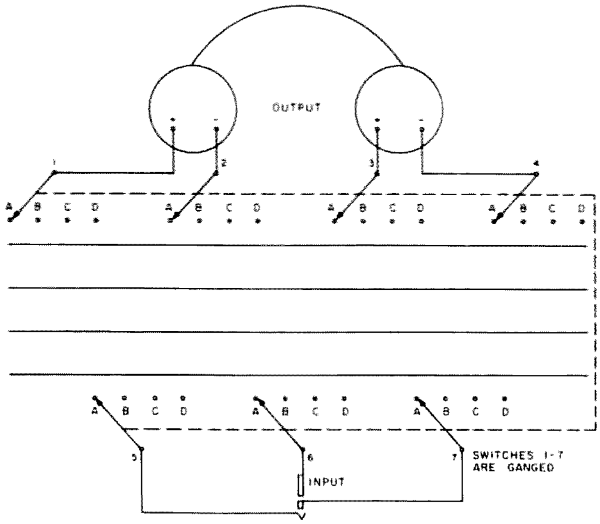

Fig. 5. Bus bars added to Fig. 3 sketch.

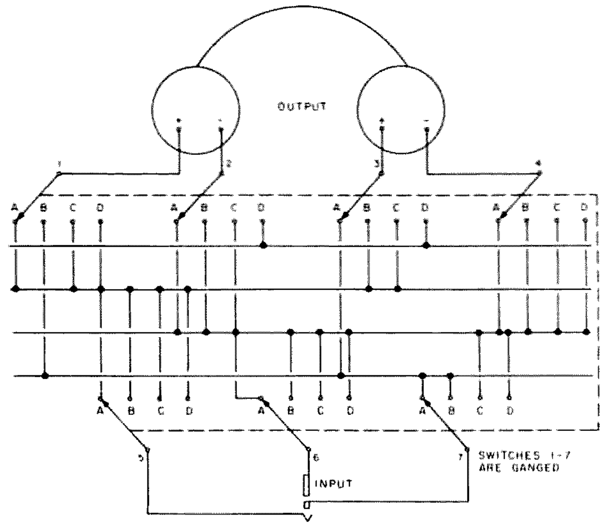

Fig. 6. All four circuits of Fig. 1 are drawn in (Common Bus method).

8) Now take your eraser and erase all seven switch arms that connect to contact A. Redraw them, this time connecting them with contact B. This may seem childish, and you may believe you'll remember that you're working with Bs instead of As, but as switching complexity builds, use every design aid that helps to keep you from getting mixed up.

9) Circuit B now can be sketched between the contact Bs of all seven switches. Looking at the input first, we see that all three input Bs can be connected to the bus elements as before. To complete circuit B, it again is necessary only to connect the output terminal contact Bs to the proper bus, using B in Fig. 1 as a guide. Both stereo functions are now designed in. Check your work carefully.

10) After erasing the switch arms on all seven switches and redrawing them all in the C position, circuit C can be sketched between the contact Cs. As usual, we start at the input end and connect the contact Cs to the bus. This time, however, it can be seen from the circuit diagram that while input terminals 5 and 6 connect to the bus as before, terminal 7 must connect with terminal 6. This is easily done using the proper bus element as the tie point. Whenever possible, all circuit connections are made via the bus elements. To complete circuit C, one now simply connects the output terminal contact Cs to the proper bus elements, according to C in Fig. 1. Checking this new addition requires care since one must be certain that no unwanted pathways are possible through parts of the circuit that are not in use.

11) Putting the eraser to good use once more, the switch arms are all transferred to contact D. Circuit D can be added now, checking it carefully against D in Fig. 1. The input terminal contact Ds are connected as they were for function C. To complete circuit D, the bus elements are used as tie points for output connections 1D and 4D as before, and in addition, it is now necessary to use the fourth bus element as a jumper between contacts 2D and 3D to complete the circuit. Your switching circuit should now look like Fig. 6.

This completes the functional design but it doesn't complete the circuit diagram. Multi-pole, multi-throw switches are not the cheapest of components, so one wants to keep them to as few sections as possible. Moreover, the more poles they have, the bigger they must be. Additionally, a good circuit becomes a better circuit if it can be simplified: There are fewer connections to be made and therefore fewer chances for mistakes; there are fewer components to fail, and there is less of a headache to treat when servicing. For these reasons, we must include two more steps in the design of our prototype switching circuit to provide analysis and simplification.

12) It's at this point that you will appreciate having chosen an area for work where you can be free to think without interruption. Look closely at your version of Fig. 6, noting carefully the connections made to each switch assembly, with an eye to simplification. Observe what has happened: The contacts of switch 4 all connect to the same bus element as do the contacts of switch 5 and switch 6 respectively. If all contacts of a switch connect to the same point electrically, it provides no function and generally can be eliminated and replaced by a single connection. This allows the elimination of switch assemblies 4, 5, and 6 and more than two dozen connections. You'll appreciate this

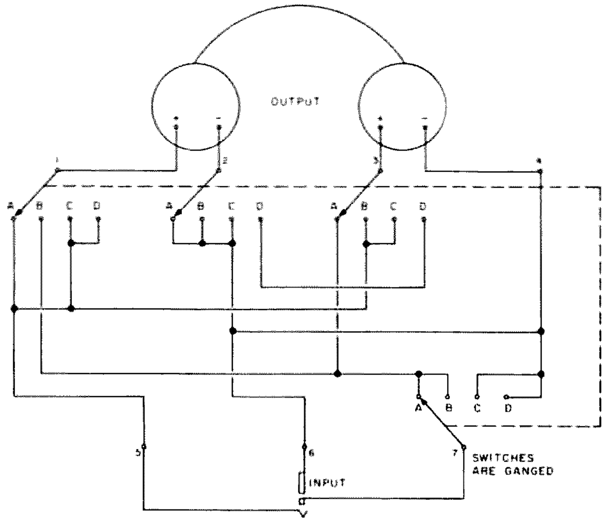

Fig. 7. The simplified system.

when the time comes for purchasing the switch and wiring it in.

13) The last step is a refinement of the previous one. Wherever the "artwork" in your circuit diagram can be simplified or clarified without sacrifice of function, do so. Replace redundant pathways with a single one; remove nonfunctional blind ends from the bus elements (the bus may disappear entirely in some designs); use short interconnections instead of long ones; minimize the number of crossovers wherever you can. When you are done, your prototype circuit will look like Fig. 7 and any of the four functions can be selected with a single 4-pole, 4-throw switch. In my prototype headphone set there was room to mount a midget 4-pole, 4-throw rotary switch in one of the phones, giving a good professional appearance.

A few words of advice: While the methods outlined above are good tools for helping the beginner solve complex switching problems, they are not the only ones and they do not substitute for good old-fashioned common sense. There may be times when the problem is solved best by a combination of methods or by one of the many other ones available. Many complex commercial design problems in switching are now solved by computer, for example. But by whatever means you derive a switching circuit, it must be checked and rechecked to ensure freedom from unwanted pathways lurking in the wiring, quite unsuspected.

When used with reasonable diligence, the methods described here provide the beginner with an excellent starting point and often the complete solution for most switching design problems.■

✓See List of Advertisers on page 114

LEDs You've Never Seen

What are these little lights? What do they do? This is the book.

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The light-emitting diode (LED) is indeed an amazing solid-state light. Its development, application in the electronics and electrical world, and acceptance by the consumer, housewife, student, and everyday person are as amazing as those of the transistor. In fact, the LED is a very close kin of the transistor—they both are solid-state devices, have junctions of P and N material, use very little power, and generally operate for a lifetime. In this article, we will detail the history, theory of operation, types, and functions of the LED, describe some applications, and take a look into the future of the LED.

History

As with many inventions and innovations in science and technology, the origin of the LED goes back many years. It was in 1907 that Henry J. Round, an electrical engineer, touched two wires connected to a battery to a piece of crystal of silicon carbide that had been found near Niagara Falls, New York. Using a potential of 10 volts dc, he connected the two wires across the two points on the crystal and found that the crystal gave out a yellowish light. Again, as with many great discoveries, he could not possibly have known of the terrific impact his "flashes of yellow light" would have on our daily lives some 60 years later. For additional details on the LED, consult the book *Light-Emitting Diodes* by Forrest M. Mims III (Howard W. Sams and Co., Indianapolis, Indiana).

It is interesting to note that the first light emitted by an LED was yellow, as this color was to be one of those produced later in commercial quantities, red being the only color developed cheaply enough at first to be used in great quantities. Red LEDs were followed by green LEDs and then the orange or orange-red color came along. Blue LEDs are still expensive and are not readily available to the popular experimenter.

The LED is a source of cold light, much like the fluorescent lamp which is gaining so much popularity as a means of conserving energy, as it generates little heat and is much more efficient than an incandescent lamp. If Mr. Round had kept his yellow flashes of light burning continuously all this time, there would still be about 30 years to go before he would notice his light decreasing slightly in intensity. Because the lifetime of an LED is so long—100 years—its lifetime is measured by its intensity or light output. When it is half as bright as it was, about 100 years will have gone by. Assuming linearity, when it is one-fourth as bright, 200 years will have gone by! The LED is indeed a Star Trek timing device for traveling to far galaxies. When it is completely out, 1000 years will have gone by! Contrast that to the 75-Watt incandescent light bulb which lasts an average of 750 hours (4½ weeks continuously) before it goes "poof" in a flash of no light.

Theory of Operation

Let's take a close look at the LED to see how it produces light. In Fig. 1, we see a PN junction which is the building block for all solid-state devices such as LEDs, diodes, transistors, and other current-controlled devices. Following electron theory that like charges repel and unlike charges attract, the anode of the PN junction of the diode will attract electrons, while the

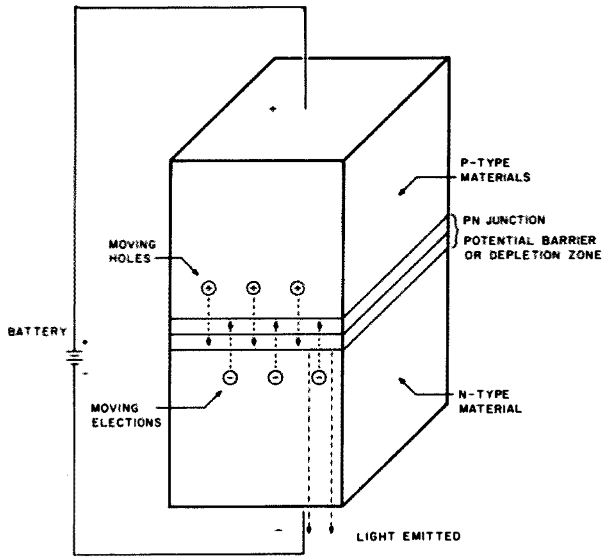


Fig. 1. Forward-biased PN junction emits light when excited electrons return to rest state.

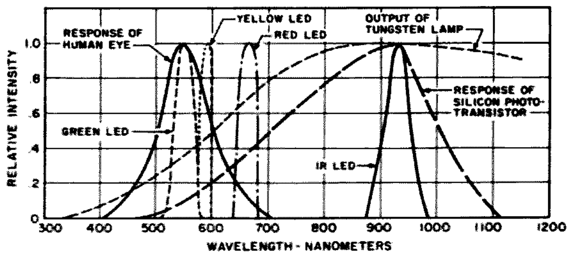


Fig. 2. Wavelength plotted against radiant energy output from green, yellow, red, and infrared LEDs.

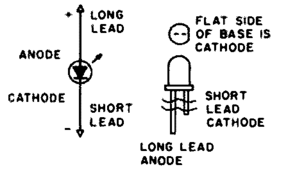


Fig. 3. Basic single-color LED.

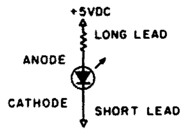


Fig. 4. LED with current-limiting resistor in same case.

cathode (negative) of the diode will attract positive "holes" (an atom missing an electron). This movement of electrons and holes constitutes a current flow and will continue as long as the voltage polarity is as shown in Fig. 1. The diode is forward-biased (anode positive) at this time and causes current (electron) flow. When the polarity is reversed (anode negative), the diode is said to be back-biased and almost no current flows. The electrons move across the PN junction to fill holes and the holes move across the junction to occupy spaces (holes) vacated by the electrons.

Light is generated when an excited electron returns to its normal state of equilibrium by combining with a hole in the valence band, its state of rest in the atomic structure. The PN junction diode is the device for raising a number of electrons into the excited state so that they can fall back into a state of equilibrium and produce light while doing it. The N side of an LED junction absorbs much less light than the P side, so the N side is usually employed as the main light-emitting region of the LED. They are usually made so the light generated at the PN junction has to travel just a short distance before being emitted into space where we see it as light. When you hold a lighted LED up close to the eye, you can see the cat's-whisker-type wire terminal connection going over to the PN junction from whence cometh the light.

Wavelength of Operation

The wavelength of operation for each of the colored LEDs is shown in Fig. 2. Note that the green LED is at a wavelength of 555 nanometers (10^{-9} meters), the maximum sensitivity of the human eye, while the red LED is at 660 nanometers where the eye "sees" only 5% to 10% of the total radiant energy from the red LED. And, of course, the infrared LED energy output is at the long wavelength of 900 nanometers which we can't see at all.

Types and Functions of LEDs

The pocket calculator and quartz crystal wristwatch really introduced LEDs to the general public. These were in the form of seven-segment numerals used for the display where each segment of the numeral was made up of one or more LED strips or a matrix of dots. There is little doubt that the pocket calculator was made possible by the development of the LED display, as all other types of displays were too large or required large amounts of electrical power. The liquid crystal display (LCD) which has become popular in wristwatches and pocket calculators was not perfected until a number of years had gone by. The original LCDs were affected by operating temperature and bright sunlight so that they had to be replaced by a jeweler every several years. In the section below, we will discuss the types of LEDs which have been developed to date and which have specific functions. We will then take a closer look at how these types may be applied to specific and general applications.

LED. The basic LED is a single-color, on-off device. Fig. 3 shows the symbol for the basic LED which can be obtained in colors of orange, green, yellow, and red. They are always used in conjunction with a current-limiting resistor. This simple LED is used as an on-off indicator, as a segment or dot matrix for numeral displays, the transmitter for optical couplers, and the like. The voltage drop across the LED itself is 1.6 V dc for red and a nominal 2 volts for green.

LED with Current-Limiting Resistor. An LED must always be operated with a current-limiting resistor in series. Fig. 4 shows a symbol for an LED with a series resistor packaged within the epoxy case. These units are designed for operation at 5 V dc TTL logic level and are available for other operating voltages.

LED with Resistor and Diode. When an LED is operated off an ac voltage, it must be provided with reverse-voltage protection as the reverse-voltage breakdown is a nominal 3 to 10 volts. This protection must be in the form of a diode or another LED in reverse polarity parallel with the LED. The average signal diode can withstand 50 to 100 volts peak inverse voltage (piv), but the average LED is limited to a nominal 3 V dc piv. Fig. 5 shows an LED complete with series dropping resistor and a reverse-protection diode, all in one package. Even though there

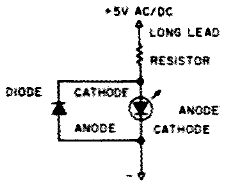


Fig. 5. LED with combined current-limiting resistor and reverse-protection diode in one package.

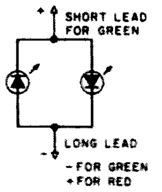


Fig. 6. Tri-color LED is achieved through reverse-parallel connection of 2-color LED chips.

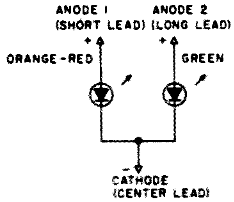


Fig. 7. The dual-color LED has 3 pins and is mounted in a single epoxy package.

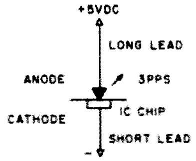


Fig. 8. Proposed graphic symbol for flasher LED. The IC chip is molded into the plastic case.

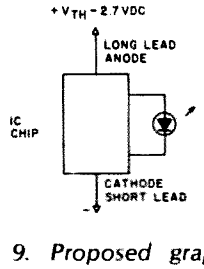


Fig. 9. Proposed graphic symbol for a voltage-sensing LED. The LED turns on within 10 mV of the threshold voltage, V_{TH}.

are 3 electrical components in the package, they are available for about 36¢ in quantities of 1000. A 5-volt source can be used to drive these type LEDs directly; they are also available to interface with a 12-volt source, ac or dc.

Tri-Color LED. The tri-color LED is really a two-color LED connected in reverse polarity paralleled in a single package as shown in Fig. 6. Two LED chips of different colors (red and green) are packaged in the same epoxy case. The characteristics of the chips are chosen so that when the red LED is on it appears as bright as the green LED when it is on. The red is at a wavelength of 697 nanometers while the green is at a wavelength of 565 nanometers, close to the maximum sensitivity of the human eye. These LEDs have a typical light output of about 2 millicandelas (2 thousandths of a candle power) at a current flow of 10 mA. As the LEDs provide reverse-polarity protection to each other, the unit can be operated on an ac voltage (with suitable dropping resistor). When operated on 60-Hz current, one LED will be on when the voltage is positive and the other LED will be on when the voltage is negative. To the eye, the LEDs will appear to be yellow or yellow-orange since the eye will integrate the discrete flashes of red and green and turn them into a yellow-orange. We will discuss the effect further under Applications of the LED.

Dual-Color LED. Once again we have two LED chips mounted in one package to simplify circuit design. However, the dual-color LED has two separate anodes and a single cathode connection as we see in Fig. 7. This LED package has 3 pins since the two anodes have separate pins while a common cathode connection is used. This type of LED is useful as it replaces 2 separate panel indicators, with the 2 color leads simultaneously available. The unit is suitable for dynamic color multiplexing and is ideal for an active visual indication of binary and trinary electronic states (orange-red—on or off, green—on or off, both—on or off).

The Flasher LED. This LED does not wear a raincoat which it "flashes" 3 times per second, as its name might imply. It does, however, have a built-in IC chip which acts as a timer so that current pulses through the LED, flashing its red light 3 times per second. As there is no standard graphic symbol for the flasher LED, the symbol shown in Fig. 8 is proposed and has appeared in several magazines.

The IC chip which is molded in with the LED in an epoxy case is usually visible through the red plastic case as a small black square dot about the size of a letter *n* of the print in this magazine. Considering the size of the chip, it is amazing to think that it is able to not only time the flash rate but also control the passage of 20 mA at 5 volts through the LED. Try doing that with discrete RC components the size of a pinhead! The red light output is 1.2 millicandelas at 5 V dc. No external parts are required, and it will operate directly off 5 V dc TTL logic level. The typical flash rate is 3 flashes per second at 5 V dc with a peak emission in the red spectrum at a wavelength of 650 nanometers.

Voltage-Sensing LED. This LED also makes use of an integrated circuit to perform its function of sensing the voltage level applied across its terminals. When the input voltage exceeds the threshold voltage, V_{TH}, the LED turns on. In fact, it "snaps on" within 10 mV of a nominal 2.7 V dc and will stay on as the voltage continues to increase up to a maximum of 5 V dc. This LED can be used as a push-to-test battery voltage tester, VU meter, etc. Fig. 9 shows the graphic symbol for the voltage-sensing LED, and again the symbol shown is proposed. Within the IC chip is a temperature-compensated reference voltage and a high-gain comparator which provides an unambiguous indication by the LED turn-on of the input voltage with respect to the threshold voltage. Through use of an external resistor, diode, or zener in series with the LED chip, the threshold voltage may be increased to any desired voltage. When a resistor is placed in parallel with the LED chip, the LED may be used as a current-sensing device. Refer to the Applications section for additional details.

Infrared LED. In appearance the infrared LED looks like any ordinary LED, whether it is housed in a red or clear epoxy case. The only thing is that the human eye cannot see the IR energy, so you can't tell whether it is on, off, good, or bad. The IR LED is used as a transmitter in intrusion devices, as the send end of a communications line (fiber optic or line-of-sight), as an object counter in conveyer belts, and for automatic flushing of urinals. Fig. 10 shows the graphic symbol for the IR LED. Note that it is identical to the visual LED except that IR has been added to the arrow light symbols. In the Applications section, we will discuss how you can easily tell if the IR LED is operating properly.

Applications of the LED

In this section we will discuss some applications of the various types of LEDs. Other applications will come to mind as you become more familiar with the capabilities of this really marvelous solid-state light.

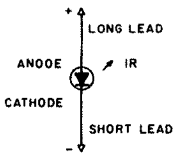
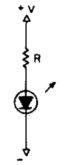


Fig. 10. The IR LED looks identical to the visible LED except its wavelength is longer and the eye cannot see its emission.



V	3	5	12	24	VOLTS
R	68	180	520	1200	OHMS

USE 1/2 WATT RESISTORS

Fig. 11. Circuit for red LED drawing 20 mA at voltages shown.

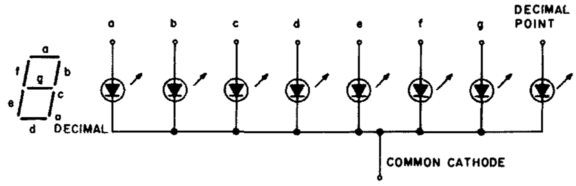


Fig. 12. Seven-segment numeral display with common cathode.

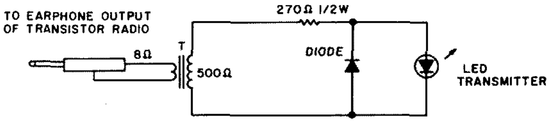


Fig. 13. An LED transmitter modulated by a transistor radio earphone output.

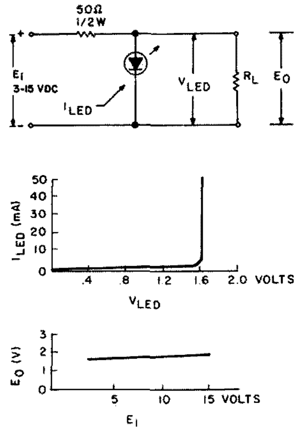


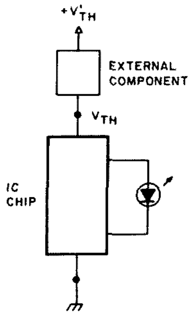
Fig. 14. The LED can serve as a voltage regulator for low current needs.

Indicators. In their simplest form, the LED is used as an indicator of the presence of a voltage or current—a pilot light. But it will never burn out in your lifetime. Always use a current-limiting resistor to limit the current to 5 to 20 mA depending on the LED. Fig. 11 shows a circuit for LED operation at 20 mA for 3 V dc, 5 V dc, 12 V dc, and 24 V dc. The voltage drop across the red LED is 1.6 V dc and the green LED is a nominal 2.1 V dc.

Displays. Alphanumeric displays were the first to take advantage of the low power consumption of the LED, the first of these being the 7-segment numeral so widely used as pocket calculator displays. These numerals usually have a common cathode or anode as shown in Fig. 12. The 7 segments are lettered a through g for identification. A separate dropping resistor is used for each segment. A binary-coded-decimal (BCD) decoder and driver are used to turn on the various segments to form a numeral or digit.

Communications. When used as a source of energy for light-beam communications systems, the LED is modulated in some manner by turning it on and off by intensity modulation (which the eye cannot observe much above about 12 Hz) or pulse position modulation. In Fig. 13, we see the circuit of an LED being modulated by the audio output from a transistor radio. The audio from this intensity-modulated light beam can be recovered by connecting a silicon or selenium solar cell across the audio input of a phono amplifier or any audio amplifier. This simple transmitting and receiving system will demonstrate the basics of light-beam communications. For many interesting details and experiments on light-beam communications, including historical details on Alexander Graham Bell's Photophone communication system using a sunbeam, see *Light-Beam Communications* by Forrest M. Mims III (Howard W. Sams, 1975).

Voltage Regulator. The voltage drop across an LED is rather constant, even with greatly increasing current through the LED. In Fig. 14, we see a circuit which uses an LED as a voltage regulator. The accompanying curve of current through the LED vs. the voltage drop across the LED shows how constant the drop is at



EXTERNAL COMPONENT	V'_{TH}
V'_{TH} — + – — V_{TH} SCHOTTKY DIODE	V_{TH}+0.45V
V'_{TH} — — V_{TH} DIODE IN914	V_{TH}+0.75V
V'_{TH} — — V_{TH} RED LED	V_{TH}+1.6V
V'_{TH} — — V_{TH} ZENER DIODE	$V_{TH}+V_Z$

Fig. 15. The threshold turn-on voltage can be increased by using an external component with the voltage-sensing LED.

1.6 volts for a red LED. The voltage input range can be increased by placing a number of LEDs in series or the output current capacity of the LED regulator can be increased by paralleling several LEDs. The circuit is especially handy where the load current is not great; at the same time, the light LEDs will indicate circuit operation.

Voltage-Sensing. The nominal 2.7-V-dc threshold voltage of the voltage-sensing LED can be increased in several ways by applying in series with the LED other devices that have known fixed voltage drops. In Fig. 15, we see how these various external components such as an LED, a diode, etc., are placed in series with the sensor to increase the turn-on voltage level.

Stroboscopic Light Source. LEDs can be turned on and off in a matter of nanoseconds. Because of this capability, they can be used as a stroboscopic light source. The most common application of such a light source is the home music record turntable. They ordinarily use a neon bulb with an orange glow to indicate when the turntable is running at the desired speed. The neon bulb will flash at the rate of 120 flashes per second when operated off 60-Hz power as the neon gas ionizes on either polarity of the line voltage. A single LED, however, will flash at a 60-Hz rate when configured as in Fig. 5. Two red or green LEDs can be made to flash at 120 flashes per second when connected in reverse polarity parallel as shown in Fig. 6.

Light Flashers Light Source. The light output of LEDs has been increased over the years by manufacturers as new materials and techniques have become available. Today, the light out-

put from an LED can be as bright at 5 mA as it used to be at 50 mA. Early LED light intensity output was 1 to 5 millicandelas, but now they are available with outputs around 100 millicandelas in the green spectrum. One bright green LED readily available is the Xciton XC-5549-G24 which puts out 24 millicandelas at 10 mA. This LED is bright enough to cast a green spot 3 feet away and can be ganged (paralleled) to make a solid-state flashlighter that can be placed in series with a common dropping resistor. Remember, the green LED has a nominal operating voltage of 2.4 to 2.7 V dc depending on the type of material used in manufacture.

A circuit for flashing the LED is shown in Fig. 16. This circuit uses a 3909 LED flasher-oscillator IC chip (National LM 3909 or Radio Shack 276-1705) to pulse the current through the LED. With the circuit values shown, the LED will flash once each second for about a year using 2 C-cells. The unit can be packaged in a spray-can top and will serve as an attention-getter placed in a window to indicate to all that can see it "that the intrusion warning device is on and armed"; it also makes a great conversation piece for your desk. The 3909 IC chip is available for about $1.00 at local electronics stores.

The flasher LED which operates at 5 V dc and flashes 3 times per second has an internal IC chip which is sensitive to light. This phenomenon can be used to change the flash rate of the LED. Certain flasher LEDs can be used as sensors to tell the difference between a cloudless, sunlit sky and a cloud passing in front of the sun. Try several flashers until you find one that shows this effect best. In Fig. 17, we see a cross-section of a flasher LED by AEG-Telefunken (CQX-21); in Fig. 18, we see a block diagram of the electronics that is inside the IC chip.

In Fig. 19(a), we see a green LED placed in series with a red flasher LED, both of them across a 9-volt battery so that they flash in unison. A piezo sounder can also be placed across the green LED to pulse each time the green LED flashes. There is no current drawn from the battery during the off-duty cycle. The piezo sounder is available from Radio Shack as RS 273-060.

Fig. 19(b) shows 2 flashers placed in series with a green LED; now we find that the LEDs pulse in series so that they go "blink-blink, blink-blink," while the piezo sounder goes "beep-beep, beep-beep." The flash rate and current drawn from the 9-volt battery are also shown in Fig. 19. The circuit should flash for several years off a type-F (6-volt) battery.

Linear Indicator Display Meter. Because the LED can respond instantaneously to applied voltage, use of the light-bar voltage or signal-amplitude linear vertical or horizontal meter has become popular. These light-bar meters are especially popular in the audio and music entertainment field as the moving display is rather dynamic in operation. They will be used more and more in the future because the linear scale can be observed from a distance considerably further away than can an ordinary meter with moving needle.

Visual AND, OR, and NOR Gate Indicators. The dual-color LED can actually display 3 color conditions plus off to indicate the logic AND state (red *and* green on), OR state (red on *or* green on), and NOR state (neither red *nor* green on; both off). With the red and green on at the same time, the color will appear yellow or orange to the eye. The tri-color reverse-parallel-connected LED will indicate red, green, or yellow in color. These will indicate the logic states as described above but can also be used to ascertain a voltage polarity state such as green for a positive voltage, red for a negative voltage (or current reversed from the green or positive voltage), or yellow for an ac voltage.

Light Detector or Sensor. All semiconductor junction devices possess some degree of light sensitivity. Glass-encased diodes, LEDs, and transistors are all light-sensitive. An LED is in effect a bi-directional photovoltaic device. That is, voltage applied to the LED causes it to emit light. But shine a light on the LED and it will produce a small voltage across its terminals. Fig. 20 shows an LED being driven by a transistor radio output; a few inches away, an LED acts as a light pick-up feeding an audio amplifier. With this simple arrangement, you will be able to demonstrate this light fantastic of the LED. In-

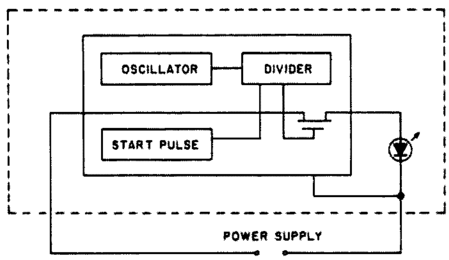


Fig. 18. Block diagram of the electronics within the IC chip of the CQX-21 Blink-LED.

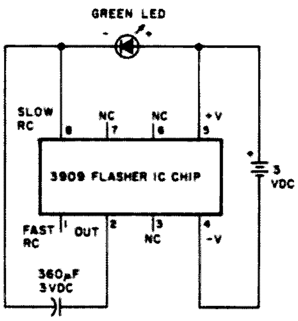


Fig. 16. This IC chip circuit will flash an LED once per second for about a year on 2 C-cells.

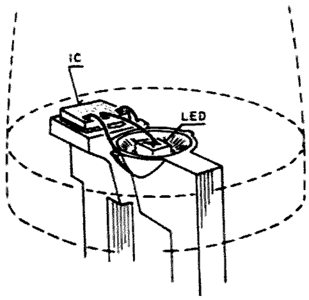
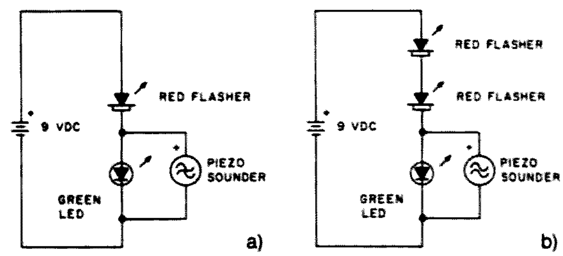


Fig. 17. Cross-section of the construction of the AEG-Telefunken CQX-21 Blink-LED.



Flashers	Flashes	Current
1	30/minute	15 mA
2	40 pair/minute	5 mA

Fig. 19.(a) Red flasher LED connected in series with a green LED. (b) Two red flashers connected in series with a green LED.

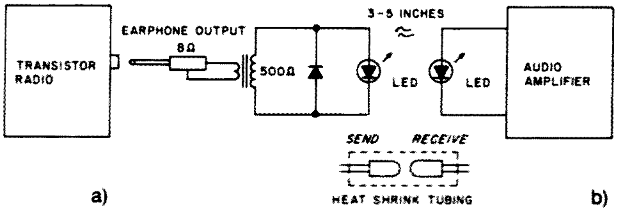


Fig. 20. The LED used as a transmitter and detector of light energy. Transmission through space is shown in (a), while (b) depicts the use of the LED as an optical coupler.

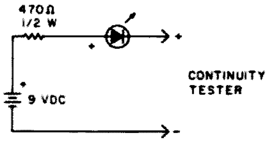


Fig. 21. The LED used as a continuity tester by adding a battery and resistor.

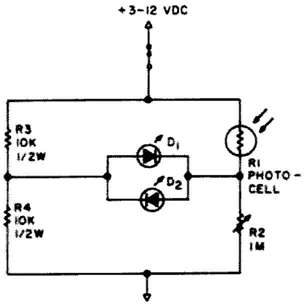


Fig. 22. A light-sensitive Wheatstone bridge which uses two LEDs to indicate when the bridge is balanced.

frared LEDs have greater sensitivity to light than do visual LEDs.

As a further demonstration of the light effect of a diode, take a glass-encased diode and connect it across the input to your audio amplifier. With the overhead lights on, you should be able to hear a 120-Hz hum with the audio gain turned up. Cover up the LED with your hand and the hum will go away.

You can make an LED optical coupler by using two LEDs head-to-head and held together by heat-shrink tubing which has been shrunk around the two LEDs. Either end of the coupler can be the send or receive link.

Intrusion Detector Light Source. As described earlier, the IR LED can be used as a transmitter for an intrusion device which bounces an invisible beam around a room. Through the use of mirrors, a room can be criss-crossed with the invisible beam light. When the beam is interrupted by anyone, an alarm is sounded. In the next section we'll discuss how you can tell if an IR LED is "alive and well" even though you can't see its radiation.

Continuity Tester. The LED can be used as an inexpensive continuity tester by connecting it as shown in Fig. 21. Use two AA cells to provide 3 V dc or use a 9-volt transistor battery that has been discarded as it will provide many months of additional service. You can build the unit in a discarded plastic top from a spray can or a plastic medicine pill bottle. The LED will be brightest when the probes are shorted together (zero Ohms) and really dim for a high resistance (10k to 20k).

Voltage Tester. In Fig. 22, we see the circuit diagram for a voltage tester using an LED as the indicator of voltage level. With the values shown, the tester will operate over a voltage range from 1 to about 30 volts ac or dc. The LED will be dim at 1 V and bright at 30 V. The voltage tester will operate off ac or dc because of the reverse-polarity LEDs. In addition, because either LED will light up on an ac or dc voltage, it is not necessary to observe polarity of the probes before placing them across the circuit to be tested.

Wheatstone Bridge. The direction of current flow is indicated by 2 LEDs that are connected in reverse polarity paralleled as we have discussed before. Because of this indication, the LEDs can be used to take the place of a galvanometer in a Wheatstone bridge. The circuit is shown in Fig. 22 and the two separate LEDs or dual-color single plastic package can be used. A photocell is used to set a light level and a potentiometer is used to null the LEDs so they both go out or are equally dim. Then, as the light level is increased or decreased, by changing the light level or moving to or from the source, one or the other LEDs will become equally dim or almost out. In this manner, the same light level can be set by a room dimmer or walking toward or away from the light source.

The LED in Motion. As discussed earlier, the LED will flash on each time its anode goes positive with respect to its cathode. When an ac or pulsating dc voltage is applied to its terminals, the LED will flash on and off. If the flash rate is from about 12 to 16 flashes per second, the LED will appear to be on all the time because the human eye cannot observe the individual flashes. Most LEDs are stationary in use and we cannot observe the effect unless we can move the LED fast enough. In order to observe that a pocket calculator LED display is being turned on and off, that is, being multiplexed, move the lighted display rapidly in an arc at arms length. You will observe individual numerals or segments being multiplexed. In the section that follows, a means of flashing or pulsing the LED is described, but for additional details on the moving LED, see *One-Evening Electronic Projects* by the author (published by Howard W. Sams, 1980).

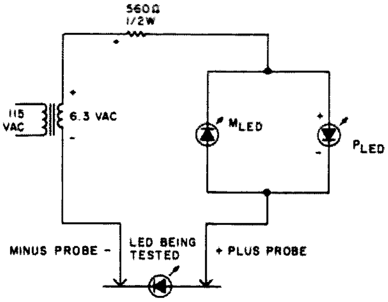


Fig. 23. This short-proof LED power supply and tester will work with any color or voltage LED.

An LED Power Supply and Tester

A question to be asked about any LED that you are going to use in a circuit concerns the condition of the LED and its connections if it is a numeral display. Also, how do you tell if an IR LED is OK to use in a circuit you are building? Fig. 23 shows a simple circuit that you can use to test any LED, diode, or transistor. You can use it to test any LED for proper operation, identify the anode and cathode in case the leads have been cut off, and identify the segments of any of the numeral digit displays. You'll be able to tell which LED is the brightest you have and separate them out by color before you install them in a circuit.

Looking at the circuit diagram you'll see that the probes have been labeled as Plus probe and Minus probe, and that the associated LED is also labeled P and M. Use a red or bright-colored lead for plus and a black or dark

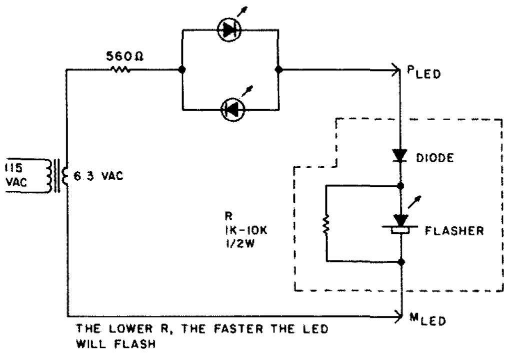


Fig. 24. By adding the components shown in the dotted lines, a flasher LED can be tested with the power supply.

lead for minus. When you short the test probes together, both of the tester LEDs will light as current is able to blow through the circuit in both directions because of the ac voltage. When you place an LED across the test probes, one or the other tester LEDs will light as well as the LED being tested. If the P LED is lit, the red probe is connected to the anode under test (and the black probe to the cathode of the LED under test). However, if the M LED is lit, the Plus probe is connected to the cathode of the LED being tested (and the Minus probe to the anode).

An IR LED can be tested in the following manner, which is the same test for any LED or diode. Let's use the diode for reference and look at the 3 conditions of that device. When a diode is good it will conduct in one direction and not the other. So on our LED power supply and tester, one LED will be on and one LED will be off. With a diode across the probes, either LED can be lit as it doesn't make any difference as long as only one is lit. The condition for a shorted diode is that it will conduct in both directions, so both LEDs would be on, just the same as when the test probes are shorted together. The remaining test, or circuit condition, for a diode is that it is open. On the LED tester, with the probes connected across an open diode, neither of the LEDs would be lit as there is no current flow through the LEDs due to the open circuit.

So now when we place an IR LED across the tester, we can tell whether it is operating properly, is shorted or open, even though we can't observe its radiation. There is no way it can be operating properly and not provide the correct symptoms of operation. And remember—you can test the LEDs in this tester without having to use a current-limiting resistor or concerning yourself about shorting the power supply leads as the supply is short-circuit-proof.

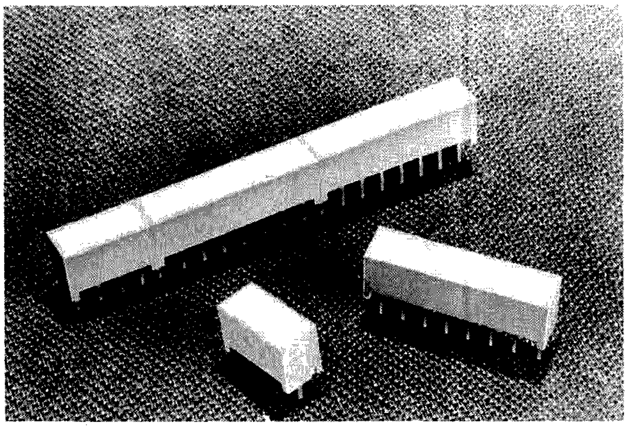


Fig. 26. A new Hewlett-Packard family of light-emitting diode light-bar modules is designed for use as back-lighting sources for display panels. (Photo courtesy of Hewlett-Packard)

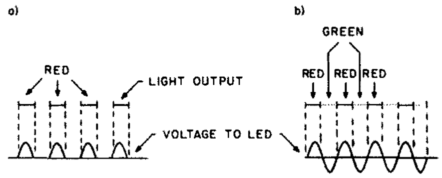


Fig. 25. A single-color LED strokes out a dashed line when moved (a), while a bi-color LED strobes out the two colors of the LED (b).

A flasher LED can be tested using the LED power supply by using several other components connected as shown in Fig. 24. The diode will provide a pulsating dc voltage to the flasher LED while the resistor across the IC chip will cause the flash rate to vary. The lower the resistance, the faster the LED will flash.

Strobing the LED

When we connect an LED to the power supply and move the LED back and forth in a short arc, the LED will be seen to strobe out a series of lines as shown in Fig. 25(a). This is due to the fact that the LED will be on only when the anode is positive with respect to the cathode. However, when we place a tri-color LED (red and green) across the probes and hold it stationary, it will appear yellow or orange to the eye. The eye will sum the two colors and see a third color. If we now move the LED back and forth, we see that the fixed orange color changes to dashes of red and green, as shown in Fig. 25(b). The dashes are the on and off periods of each of the colors. Since we are using 60-Hz power, each of the dashes lasts for 1/120 of a second, or 1/60 of a second for a complete red-green cycle.

What the Future Holds

In the game of electronics, it is sometimes difficult to project where a certain product or process will go or how far it will go. The pocket calculator would not have been possible without the LED display and the calculator itself wouldn't have worked without the invention of the IC chip. The pocket radio would not have been possible without the transistor, but without the development of the small ferrite loopstick antenna, the whole pocket radio would not have been possible. So one development depends on another. The Dick Tracy wrist TV transmitter will one day be here, but in the meantime, more realistic developments will arrive on the scene. Some items on the scene, or almost in sight, are discussed below.

Barlights and Odd Shapes

In Fig. 26, we see a barlight available from Hewlett-Packard in colors of red, yellow, and green. These barlights are about ½ inch wide and 1 inch long and the whole surface is made to glow evenly. They can be placed end-to-end to form a long column or used in any arrangement that a designer might want in order to display numerals, play light music of different colors when operated off a stereo music amplifier, or make a large, cool-light mosaic display. In Fig. 27, we see a number of

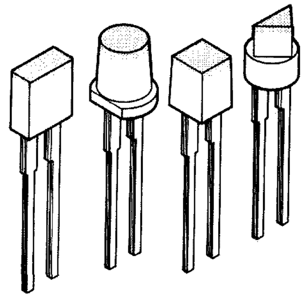


Fig. 27. Unusual LED shapes available from AEG-Telefunken.

LEDs available from AEG-Telefunken shaped as circles, squares, and triangles which can be arranged to form other figures such as arrows, rectangles, dots, dashes, and colons.

Flat-Screen Color TV. A dream of the TV industry is to make a flat-screen TV set. The CRT is also the most expensive component in the TV set and its lifetime is limited due to filament aging. So if the CRT would be replaced with a solid-state video light source such as the LED, the TV set could indeed be all solid state and would actually last a lifetime. Such a development that could lead to a flat-screen TV is an announcement by Sanyo that it has developed a multicolored LED which emits colors from red through green, including the in-between hues. This LED is made from phosphorized gallium and will have a long lifetime. Sanyo's goal is to develop an LED that is capable of emitting the three primary colors necessary in a TV receiver—red, green, and blue.

Three-color LED. Before we get to the three magic colors of the TV set—red, green, and blue—we must be willing to take what technology has to offer us at the time. It was announced recently that Roza Luksemburg Electric Lamps Manufacturing Works of Warsaw, Poland, has developed and produced a three-color LED. Each LED has three structures, two GaAsP semiconductors which emit red and yellow light and a third structure of GaP which emits green light. These structures are all contained in a single plastic housing and are connected by a common cathode. Separate anode terminals exist for each of the 3 colors so that it is a 4-terminal LED. It is the common cathode which acts as the light color radiator. By means of symmetric spacing of the structures in a common deep reflector, uniform illumination of the light-emitting surface occurs. This type of LED can be used in a radio tuner where the 3 colors could indicate high tuning, low tuning, and on frequency. They could also be used as gauges to indicate above value, below value, and set on desired value.

Remote Reading of Utility Meters. For the past 100 years or so, electrical, natural gas, and water utility meters were read up close visually or, where possible, from a distance by means of a telescope. Various utility companies have been investigating means of doing the reading of the utility meter by some rapid and accurate method. Energy Optics, Inc., of Las Cruces, New Mexico, has installed a remote infrared meter access system to allow electric utility personnel to read meters from a moving vehicle using light-beam communications. The present installations can be read at ranges of up to 200 feet with a vehicle speed of about 15 mph. Infrared light pulses are generated by an LED or low-power laser diode. Later installations will be installed which will allow reading ranges of up to 1000 feet using a fast-moving van or low-flying aircraft. The diode laser power is extremely low but transmits the meter account number, an eight-digit meter reading, and other test data.

LED Types and Sources

Various types of LEDs have been described in this article. Most of them are readily available in small quantities of interest to an electronics experimenter or innovator. Some of the sources for some of the types of LEDs are shown in Tables 1 and 2. Consult the advertisements in this magazine for additional sources of supply and pricing information. ■

Type LED	Source
Single color Red, Yellow, Green	Hewlett-Packard, Dialight, Xciton, AEG-Telefunken, Industrial Devices, Inc., Radio Shack, Litronix, Texas Instruments, others
Single color with resistor	H-P 5082-4860 (red)
Single color with resistor and diode	H-P HLMP-3105 (red), HLMP-3680 (green)
Tri-color LED	Radio Shack RS-276-035 (red-green-yellow), IDI 4301H1/5 (red-green)
Dual-color LED	AEG-Telefunken CQ X95 (orange red-green), Opcoa LST-710 (red-green)
Flasher LED	Radio Shack 276-036 (red) Litronix FRL-4403 (red)
Voltage-sensing LED	H-P 5082-4732 (red)
IR LED	Radio Shack 276-141 (IR) TI TIL32
Rectangular LED	General Instruments CM4-65 H-P HLMP-2300 (red)

Table 1. LED types and sources.

Radio Shack	Neighborhood stores
H-P	Hewlett-Packard 1501 Page Mill Road Palo Alto CA 94304
Litronix	Litronix, Inc. 19000 Homestead Road Cupertino CA
Xciton	Xciton Corp. Shaker Park 5 Hemlock Street Latham NY 12110
IDI	Industrial Devices, Inc. Edgewater NJ 07020
Dialight	Dialight Corp. 203 Harrison Place Brooklyn NY 11237
AEG	AEG-Telefunken B. H. Frank Co. 3733 W. 139 St. Hawthorne CA 90250
Opcoa	Opcoa 330 Talmadge Road Edison NJ 08817
GI	General Instruments Corp. 4430 N. Ravenswood Ave. Chicago IL 60640
TI	Texas Instruments, Inc. PO Box 5012 Dallas TX 75222

Table 2. LED source addresses.

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

JENSEN BEACH FL
FEB 25

The Martin County Amateur Radio Association will hold its annual free outdoor hamfest and swapmeet on Saturday, February 25, 1984, from 8:00 am to 4:00 pm, at Langford Park, Route 707, Jensen Beach FL. Bring your own table; swap-table and tailgate space will be available. There will be food, drinks, and desserts available throughout the day, and a playground for the kids, so bring the family. Talk-in on 147.06, down 600. For further information, write MCARA, PO Box 1901, Stuart FL 33495.

CINCINNATI OH
FEB 25-26

Cincinnati ARRL '84, the fourth annual Ohio state convention and flea market, will be held on February 25-26, 1984, at the Great Oaks Vocational Campus, 3254 East Kemper Road, Sharonville, Cincinnati OH. Registration is $5.00 and flea-market space is $4.00 for two days (ham and electronic items only). Activities will include forums, meetings, vendors, Wouff Hong, women's programs, a banquet, and a hospitality suite on Friday and Saturday nights. For more information, write Cincinnati ARRL '84, POB 11300, Cincinnati OH 45211, or telephone (513)-825-8234.

DAVENPORT IA
FEB 26

The Davenport Radio Amateur Club, Inc., will hold its 13th annual hamfest on Sunday, February 26, 1984, from 8:00 am to 4:00 pm, at the Davenport Masonic Temple, Highway 61 (Brady Street) and 7th Street, Davenport IA. Tickets are $2.00 in advance and $3.00 at the door. Table rentals are $7.00 each, with a $2.00 charge for an electrical hookup. Talk-in on .28/.88 (WØBXR repeater). For table reservations and advance tickets, write Dave Johannsen WBØFBP, 2131 Myrtle Street, Davenport IA 52804.

LAPORTE IN
FEB 26

The LaPorte Amateur Radio Club, Inc., will hold its Winter Hamfest on Sunday, February 26, 1984, beginning at 7:00 am (Chicago time), at the Civic Auditorium, LaPorte IN (45 miles SE of Chicago on I-80). Admission is $2.50 per person. There will be 180 8-foot tables for $2.00 each by reservation. Food and drinks will be available. Sellers will receive help unloading. Talk-in on .52 simplex. For tables, tickets, or more information, send an SASE to LPARC, PO Box 30, LaPorte IN 46350.

MORRIS PLAINS NJ
MAR 2

The Split Rock Amateur Radio Association will hold its annual auction on Friday, March 2, 1984, at the VFW Post, Mt. Tabor Road, Rt. 53 (between the train station and Warner-Lambert), Morris Plains NJ. The doors will open at 7:00 pm and the auction will begin at 8:00 pm. A cash bar will be available. Talk-in on .385/.985 and .52.

CIRCLEVILLE OH
MAR 4

The Teays ARC will hold its seventh annual King of the Pumpkin Hamfest on Sunday, March 4, 1984, from 8:00 am to 4:00 pm, at the new location, the K of C Building, 2489 N. Court Street. Tickets are $2.00 in advance and $3.00 at the door; tables are $4.00 in advance and $5.00 at the door. Food and plenty of parking will be available. For more information, write Dan Grant W8UCF, 22150 Hulse Road, Circleville OH 43113, or phone (614)-474-3026.

LIVONIA MI
MAR 4

The Livonia Amateur Radio Club will hold its 14th annual LARC Swap 'n' Shop on Sunday, March 4, 1984, from 8:00 am to 4:00 pm, at Churchill High School in Livonia MI. There will be plenty of tables, refreshments, and free parking. Talk-in on 144.75/5.35 and .52. Reserved table space with a 12-foot minimum is available. For further information, send an SASE (4 × 9) to Neil Coffin WA8GWL, c/o The Livonia Amateur Radio Club, PO Box 2111, Livonia MI 48151.

NORTH AMERICAN TELECONFERENCE RADIO NET
MAR 8

The Honeywell Amateur Radio Clubs will present the North American Teleconference Radio Net (TRN) at 7:30 pm CST on Thursday, March 8, 1984. Featured speakers will be attorneys Chris Imlay N3AKD, Jim O'Connell W9WU, Joe Merdler N6AHU, and Bob Benson QC VE2VW, who will be discussing the legal aspects of amateur radio. For a list of stations providing a gateway into TRN, check the Compuserve "Hamnet" X10 Database or send an SASE to net manager WØTN, 4749 Diane Drive, Minnetonka MN 55343.

EGG HARBOR CITY NJ
MAR 10

The Shore Points Amateur Radio Club, Inc., will hold the Springfest '84 on Saturday, March 10, 1984, from 9:00 am to 4:00 pm, at the Atlantic County 4-H Center, Egg Harbor City NJ (approximately 15 miles west of Atlantic City). Admission for buyers is $2.50 in advance and $3.00 at the door; sellers' space is $5.00 (bring your own table). There will be 8,000 square feet of heated indoor selling space, and covered tailgating will be available, weather permitting. For more information, write SPARC, PO Box 142, Absecon NJ 08201.

WINCHESTER IN
MAR 11

The Randolph Amateur Radio Association will hold its 5th hamfest on Sunday, March 11, 1984, from 8:00 am to 5:00 pm, in the National Guard Armory, Winchester IN. Ticket donation is $3.00 and children under 12 years old will be admitted free. Table space (by reservation only) is $5.00 with a table and $2.50 without. There will be a flea market, dealers, programs, food, and drink. Setups will be on Saturday from 6:00 pm to 8:00 pm and on Sunday from 6:00 am to 8:00 am. Talk-in on 147.90/.30, 224.90/223.30, and 146.50. For reservations and more information, contact RARA, Box 203, Winchester IN 47394, or phone Jake Life W9VJX at (317)-584-9361.

INDIANAPOLIS IN
MAR 11

The Morgan County Repeater Association Club will hold the Martinsville Hamfest on March 11, 1984, indoors at the Indiana State Fairgrounds Pavilion Building, Indianapolis IN. Admission is $4.00 at the door. Premium tables are $30.00 each, flea-market tables are $8.00 each, and flea-market space without a table is $1.00. All tables must be reserved in advance and setup will be Saturday, March 10, from 1:00 pm to 9:00 pm. Space setup will be Sunday, March 11, from 6:00 am to 8:00 am. There will be free paved parking. Talk-in on 147.21 and 146.52 simplex. For more information or table reservations, send an SASE to Aileen Scales KC9YA, 3142 Market Place, Bloomington IN 47401 before March 1.

HUDSON NH
MAR 17

The annual Interstate Repeater Society Flea Market will be held on March 17, 1984, at the Hudson Lions Club, Lions Avenue, Hudson NH. The doors will open at 8:00 am and the flea-market hours will be 9:00 am to 4:00 pm. Admission is $1.00 and tables are $7.00 each. Coffee, donuts, hot dogs, hamburgers, and drinks will be available for sale. Talk-in on 146.85 and 146.52. For more information, phone Herman Haberman WA1NYS at (603)-882-6859, or write Interstate Repeater Society, PO Box 693, Derry NH 03038.

CANTON OH
MAR 17

The Canton Amateur Radio Club will hold its annual auction on March 17, 1984, beginning at 5:00 pm, at the Nimishillen Grange, Easton Street NE. General admission is $2.00 in advance and $3.00 at the gate. An 8-foot flea-market table is $1.00 (supply is limited). Refreshments will be available. Talk-in on .72/.12. For advance tickets, send an SASE to Arthur E. Schermerhorn W8FEC, 505 E. Mohawk Drive, Malvern OH 44644, or for more information, call Scott Duncan KK8D evenings at (216)-484-6722.

MIDLAND TX
MAR 17-18

The Midland Amateur Radio Club will hold its annual St. Patrick's Swapfest on Saturday and Sunday, March 17-18, 1984, at the Midland County Exhibit Building, east of Midland TX on the north side of Highway 80. The hours on Saturday are from 10:00 am to 6:00 pm and on Sunday from 8:00 am to 2:30 pm. Registration is $5.00 in advance and $6.00 at the door; tables are $6.00 each. Refreshments will be available. Talk-in on .16/.76 and .33/.93. For further information and reservations, please contact Midland Amateur Radio Club, PO Box 4401, Midland TX 79704.

Continued on page 98

SATELLITES

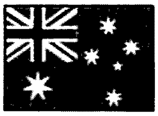
Amateur Satellite Reference Orbits

Date		OSCAR 8 UTC	OSCAR 8 EQX	RS-5 UTC	RS-5 EQX	RS-6 UTC	RS-6 EQX	RS-7 UTC	RS-7 EQX	RS-8 UTC	RS-8 EQX	Date
Mar	1	0107	110	0038	328	0147	352	0016	325	0033	323	1
	2	0111	111	0033	328	0131	349	0006	324	0030	324	2
	3	0115	112	0028	328	0116	347	0156	353	0027	325	3
	4	0120	113	0022	328	0101	345	0146	352	0024	326	4
	5	0124	114	0017	329	0045	342	0136	351	0022	327	5
	6	0128	115	0012	329	0030	340	0127	350	0019	327	6
	7	0133	116	0006	329	0014	338	0117	349	0016	328	7
	8	0137	118	0001	329	0158	5	0107	348	0013	329	8
	9	0141	119	0155	359	0142	3	0058	347	0010	330	9
	10	0002	94	0150	360	0127	1	0048	346	0007	331	10
	11	0007	95	0144	360	0111	358	0038	346	0005	331	11
	12	0011	96	0139	360	0056	356	0029	345	0002	332	12
	13	0015	97	0134	0	0041	354	0019	344	0159	3	13
	14	0020	98	0128	0	0025	351	0010	343	0156	4	14
	15	0024	100	0123	1	0010	349	0000	342	0153	5	15
	16	0028	101	0118	1	0153	16	0149	11	0150	6	16
	17	0033	102	0112	1	0138	14	0140	10	0147	6	17
	18	0037	103	0107	1	0122	12	0130	9	0145	7	18
	19	0041	104	0102	1	0107	9	0120	8	0142	8	19
	20	0046	105	0056	1	0051	7	0111	7	0139	9	20
	21	0050	106	0051	2	0036	5	0101	7	0136	10	21
	22	0054	107	0046	2	0021	2	0051	6	0133	10	22
	23	0059	109	0040	2	0005	0	0042	5	0130	11	23
	24	0103	110	0035	2	0149	27	0032	4	0128	12	24
	25	0107	111	0030	2	0133	25	0022	3	0125	13	25
	26	0112	112	0024	3	0118	23	0013	2	0122	14	26
	27	0116	113	0019	3	0102	21	0003	1	0119	15	27
	28	0120	114	0014	3	0047	18	0153	30	0116	15	28
	29	0125	115	0008	3	0032	16	0143	29	0113	16	29
	30	0129	116	0003	3	0016	14	0133	29	0111	17	30
	31	0134	117	0157	34	0001	11	0124	28	0108	18	31
Apr	1	0138	119	0152	34	0144	39	0114	27	0105	19	1
	2	0142	120	0147	34	0129	36	0104	26	0102	19	2
	3	0003	95	0141	34	0113	34	0055	25	0059	20	3
	4	0008	96	0136	34	0058	32	0045	24	0056	21	4
	5	0012	97	0130	35	0042	29	0035	23	0054	22	5
	6	0016	98	0125	35	0027	27	0026	22	0051	23	6
	7	0021	99	0120	35	0012	25	0016	21	0048	24	7
	8	0025	101	0114	35	0155	52	0006	21	0045	24	8
	9	0029	102	0109	35	0139	50	0156	50	0042	25	9
	10	0034	103	0104	35	0124	48	0146	49	0039	26	10
	11	0038	104	0058	36	0109	45	0137	48	0037	27	11
	12	0042	105	0053	36	0053	43	0127	47	0034	28	12
	13	0047	106	0048	36	0038	41	0117	46	0031	28	13
	14	0051	107	0042	36	0022	38	0108	45	0028	29	14

73 INTERNATIONAL

Each month, 73 brings you ham radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Jack Burnett.*



AUSTRALIA

J. E. Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria
Australia

VK8—WEST AUSTRALIA

West Australia is the home of America's Cup—and with the eventual win by the West Australian syndicate and worldwide attention focused on this area of Australia, it became evident that not many people throughout the world have much idea about this vast state.

We have eight call areas on the mainland, of which VK6, with a land area of 975,101 square miles and a coastline of 7,768 miles, is the largest. It is indeed a vast area, with a very sparse population in the areas away from the major towns, with a total population for the whole state of 1,300,000, most of whom live in Perth and the larger towns scattered around the southern half of the state. The total amateur-radio population is 1,226, which means one amateur to every 795 square miles.

Albany, in the south of the state, was a port in the 1900s for those hardy whaling ships, one of which was the same *Cheynes II* that refueled there on its way down to Heard Island with the Jim Smith DXpedition. Between Albany and Perth, further north up the coast, is an area of beautiful tall forests with perhaps the best area of native Australian wild flowers in the state. Perth itself is a city very isolated from the eastern states by a large desert extending for 1,000 miles.

Perth, where the 1987 America's Cup will be contested, is located a short distance from the deep blue Indian Ocean. It has a lot of amateur activity, and with the ease of reciprocal licensing between Australia and the States, it would pay you to bring a 2-meter FM rig as it is easy to access the 2-meter repeaters with a hand-held and meet many of these friendly West Australian amateurs.

Perth also has an amateur award called The Black Swan—this bird being the state emblem. Also, if you are looking for a QSL card for VK8-Willis Island, VK6YL has all the logs for this operation; she is the QSL manager for all the Willis Island operations of latter years.

Kalgoorlie is the largest inland town, situated 350 miles east of Perth in a very dry desert area; the water for this city is piped in from near Perth. There is an interesting story appertaining to the pipeline. The engineer who built it predicted that the water, after being turned on at Perth, would arrive the next morning at 11 am. The townspeople had bands and festivities scheduled for this gala occasion, but the water had not arrived even by that night, so, in shame, the engineer shot himself. It was premature, for the water started to flow the *next* morning, 24 hours later. And it has kept flowing ever since.

There are many amateurs scattered throughout the vast desert spaces of this area. If you go visiting, take a metal detector, for the area is rich in minerals, with gold and nickel predominating. Many people have made a year's wages in a week by detecting the alluvial gold at this location. A lot, also, have found nothing.

Going east from Perth, you pass through a large grain-growing area near the coast, and then you enter sheep and cattle properties trying to survive in a harsh environment with temperatures going up to and over 120 degrees Fahrenheit. Some of these properties cover well over 1,000,000 acres, and amateur radio is a good standby in this area, not only for emergencies, where their nearest neighbor could be at least a hundred miles away, but also for those infrequent idle hours to relieve the isolation.

The northern part of the state (The Kimberleys, as it is called) is perhaps the most ruggedly beautiful area. It has large deposits of iron ore and towns fully air-conditioned by the companies extracting the mineral for export all over the world. It also is not unusual to hear a typical American voice using a VK6 callsign operating from this area, as there is a joint Australian and American communications base at a place called North West Cape.

Further inland are Australia's largest diamond deposits, located in a diamond pipe similar to the famous diamond pipes in South Africa.

One very active amateur from this remote area is Ian VK6IH, who acts as net controller for the Caribbean DX Net on 14.128 at 1000Z.

The northernmost part of the state was first discovered in the early fifteenth century by Dutch explorers, 200 years before Captain Cook first landed on the east coast of Australia and claimed the land for England. This area was, in the early 19th century, the main pearling center of Southeast Asia, with the main port being Broome, a seaport with tides that rise and fall up to 35 feel at a time. There is an active YL operator in this area, Trisha VK6KI, located in a small community offshore on Koolen Island.

Some of the early operators had to travel up to 1,000 miles just to sit for their amateur license, with no local radio club to help with their training, so if you do work one of these outback VK6 operators, you know that they have earned their right to be on the amateur bands the hard way.

If you plan to come to VK8 for the Cup Challenge, the address to write for a reciprocal license is The State Manager, Radio Frequency Management, Operators Branch, PO Box 8189, Perth 6000, West Australia.

VK2—LORD HOWE ISLAND

First discovered in 1788, Lord Howe Island is located 700 km east of the coast of New South Wales (VK2) and is part of that state.

Being so far off the coast of Australia, it is classed as a separate country for DXCC.

The first successful settlement of this island was in the 1830s by an American whaler named Nathan Thompson, who brought with him a princess whom he had saved from an arranged marriage in the Gilbert Islands. They later married, and their graves are on the island. Many of the island people are their direct descendants.

There are a couple of amateurs active on the island, with many visiting operators using portable Lord Howe. There is usually one type of DXpedition from this island each year; this year there will be approximately 10 operators on all bands, including 160 meters, from October 23rd until November 2nd. As you can see, this is not one of our rarer islands—not like the next piece of sand:

VK9—MELLISH REEF

This "country," to use the term loosely (I don't know how anybody could class Mellish Reef as a country), is only a coral sand cay 300 meters long by 60 meters wide, located at 17° 25' longitude, 155° 51' East latitude, and only 2 meters above sea level at normal high tide. With the many cyclones that go through the area each summer, however, if planning an expedition to this spot during the cyclone season, one of the main items of gear to pack would be a face mask and snorkel. This is why I question the status of "country" for places like Mellish Reef.

WIA EXTENDS MEMBERSHIPS

The Wireless Institute of Australia, which is the world's oldest radio society, has opened its membership to those living outside Australia.

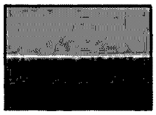
Already a number of radio amateurs in the US, UK, and Oceania have joined the WIA—which celebrates its 75th anniversary in 1985 with some special events planned.

Overseas members are entitled to qualify for WIA awards, including the Australian DXCC, and have unlimited use of the free QSL bureau run by the WIA in VK3.

All members receive a copy of the WIA's monthly magazine, *Amateur Radio*, which is in its 51st year of publication.

Annual membership during 1984 is $35 (Australian), which should be sent to the Secretary, Wireless Institute of Australia, Victorian Division, 412 Brunswick Street, Fitzroy 3065, Australia.

While some of the members of the party still were at sea, one of the lucky 13 was being hoisted to shore.



COLOMBIA

Abelardo (Lalo) Santos V. HK3EQJ
PO Box 88937
Bogota 8
Colombia

MALPELO ISLAND, 1983 DXPEDITION

"We both feel that this was one of the best operations in the history of amateur radio. We have never heard such excellent control, rapid operating, and fine CW."—Stuart WA2MOE, Ben JA3GM.

"Congratulations on the 50th anniversary of the LCRA and the Malpelo DXpedition. I was delighted for having realized such a difficult and priceless QSO. Your QSL will be my treasure."—Ben JA3GM.

Countless congratulatory letters, messages, articles, and TV and broadcast programs' comments poured in after the Malpelo Island DXpedition took place. Meanwhile, Beto Rojas HK3DDD, on an almost round-the-clock task, helped by his XYL Luisa and two children, systematically and tirelessly keeps processing and mailing thousands and thousands of QSL cards from/to all over the amateur world.

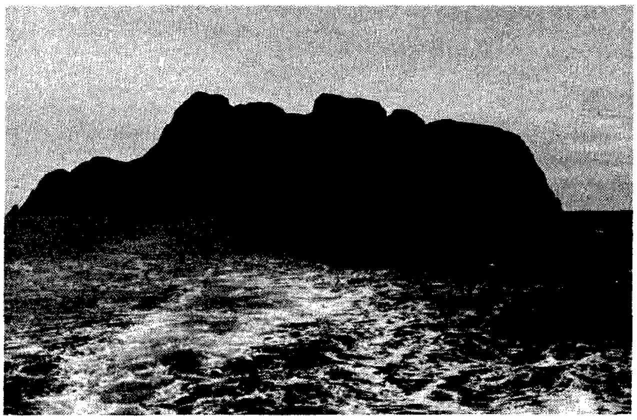
The two voice and one CW stations manned by thirteen operators, accompanied by one TV man and three Colombian Navy sailors (for the expedition's logistic support), managed to log 20,535 voice and 8,389 CW QSOs. They worked a hundred hours from dawn well into the night, until propagation conditions were inexorably closing the bands.

The three generators, two in operation and one on standby, worked perfectly, as did the Kenwood TS-930S transceivers (supplied free of charge for the expedition), keeping well abreast with the over-demanding operating conditions.

The camp base was installed at 160 meters above sea level on the barren volcanic surface of the island. The site was constantly swept by almost gale-force winds which frequently knocked down the tents and dangerously twisted the antennas. The expedition had rainy weather from landing till the minute it left.

As a rare coincidence with the previous Colombian Islands DXpeditions, the radio ham in charge of the health and sanitary backup arrangements, this time OM O

The world was listening to HK0TU.



Good-bye, Malpelo, see you again in 1990.

Campillo HK4DUM, had a fall on landing, was subsequently struck by a wave, and sustained injuries to his right leg. Fortunately, it was nothing serious, and he was taken care of by his colleagues.

The help and assistance given to the DXpedition by the Colombian Navy, with the *CNSS Providencia* from its QTN in Buenaventura Port to Malpelo Island and back, were continuous and flawless. Since there are no docking facilities at Malpelo, the 13 operators, the TV cameraman, Luis Fernando Castrillon, the three sailors, and all the equipment had to be lowered to the shore of the island by means of a crane—and picked up the same way. Since the sea was rough at both times, certainly it was not a very easy-to-forget experience for all of them.

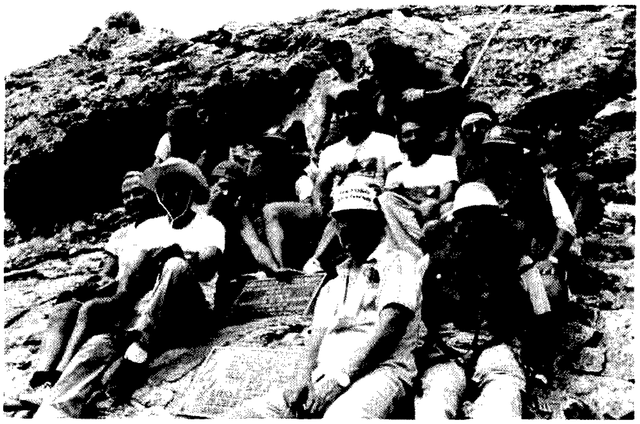
Once the party was back in Buenaventura, a Colombian Air Force transport plane flew them back to Bogota, where the National Police Band received them with full honors.

Tired, suntanned, but deeply proud and satisfied with their accomplishment, they were warmly greeted by relatives, colleagues, and friends and started going back home full of souvenirs and unforgettable experiences. They left in a rock at Malpelo Island a commemorative plaque saying: "Republic of Colombia, Colombian Radio Amateur League, HK0TU, Commemorative DXpedition of the 50th anniversary of the League, with the cooperation of the Colombian Navy, Malpelo, October 12, 1983."

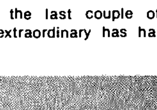
Mr. Belisario Betancourt, the Colombian President, sent the Malpelo expeditionary party a congratulatory message saying: "It is very encouraging to see a group of Colombian radio amateurs who are moved only by the wish of serving fellow men, reaffirming through their hard work and devotion the Colombian sovereignty over the Malpelo Island territory, thanks to the cooperation given by the Colombian Navy and the Colombian Radio Amateur League. . . Through investigation and radio experimentation we wish to confirm our desire to bring together our nation with itself and the rest of the world.

"I wish they will have plenty of DXs and that on their way back they will bring us all a better knowledge of the Malpelo Island, thanks to them now closer to our heart."

When the *CNSS Providencia*, bringing the Malpelo DXpedition back to the continent, was deep into Pacific Ocean waters and the island was getting smaller and more diffused, one of the excited young expeditioners loudly said: "Good-bye, Malpelo, we'll see you again in 1990."



The DXpedition party had just landed. Top to bottom: O. Campillo HK4DUM, G. Cuartas HK4COK, A. Afanador HK3BED, B. Aguilar HK1AMW, Beto Rojas HK3DDD, J. Restrepo HK2YO, E. Bernal HK3BAV, E. Londono HK4BHC, A. Carrisoza HK3BAE, J. Uribe HK5LA, A. Gonzalez HK1DBO, H. Olarte HK1QQ, C. Alvarez HK8BYG.



CYPRUS

Aris Kaponides 5B4JE
PO Box 1723
Limassol
Cyprus

NEWS FROM CYPRUS

During the last couple of months, nothing extraordinary has happened in the sphere of ham radio in Cyprus; however, it should be noted that as far as I know, we had at least one participant in the *CQ* WW Phone Contest. He was 5B4LP, who made a total of 86 countries, 31 Zones, and 521,118 points. 5B4LP is a promising young man aged 15 years, and he is very enthusiastic and a regular operator on the 10m, 15m, 20m, 40m, 80m, and 2m bands. He can be heard also on the 10m FM mode chatting with Europeans or Americans via repeaters.

Also during the last month, elections were held for the regional committees of the Cyprus Amateur Radio Society in the districts of Limassol, Paphos, and Larnaca. The clubs in Nicosia, Larnaca, Limassol, and Paphos have been reactivated and operate one day per week.

The ZC4s are also quite active, especially from their club station in Episcopi, ZC4EPI, where they are using a couple of V-wire beams 329 feet long beaming towards Europe and the Pacific. Regular operators there are Andy ZC4HA, Steve ZC4SM, Jim ZC4JE, and Gregg ZC4GH.

On 160m, the only operator at this time is 5B4JE who is QRV most evenings on 1,835 MHz around 2100 UTC.

The Cyprus Amateur Radio Society has decided to buy a UHF repeater and members of the society will shortly make expeditions to find the most suitable location up on the mountains.

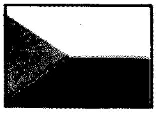
VISITORS' LICENSES

Holiday makers in Cyprus who are holding a radio amateur's license in any country of the EEC, any British Commonwealth country, or the United States of America can be issued with a temporary license free of charge if they send a photocopy of their license with a letter of application to: Chief Telecommunications Officer, Ministry of Communications and Works, Nicosia, Cyprus. it is advisable to apply at least three months before the

The 1983 DXpedition commemorative plaque.

Andreas 5B4LP operating during the CQ WW Phone Contest.

time of arrival. Visitors can use their own callsign with /5B4 at the end. A regular 5B4 license can be issued to foreign hams from the above countries if they are working or have their permanent residence in Cyprus.



CZECHOSLOVAKIA

Joachim Miroslav OK1WI
Bocni I. 23
141 00 Praha 4-Sporilov
Czechoslovakia

According to the 1983 *Radio Amateur Callbook* census, the number of amateur radio stations in Czechoslovakia is 3279. As many of the stations are collective (club) stations, the number of operators may be estimated as being at least 10,000.

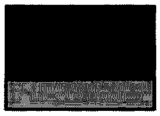
Two amateur journals are published monthly in OK-land: *Amaterske Radio*, with about 100,000 copies monthly, bringing technical and operational information on amateur radio, general electronics, and computer techniques, and *Radioamatersky Zpravodaj* (*Radio Amateur, A Messenger*), with much lower circulation, bringing technical and operational information on amateur radio. For example, the December, 1983, issue of *Amaterske Radio* brings a description of the newly-developed HF transceiver "Labe," made by Radiotechnika in Hradec Kralove (60 W, all bands, including all WARC 79 bands). On the other hand, the October, 1983, issue of *Radioamatersky Zpravodaj* brings a description of the hand-held, two-meter transceiver "Mazak," showing that even with limited possibilities of homemade work, it is possible to have a two-meter contact of good quality.

Fox-hunting, or amateur-radio DF, is very popular with younger amateurs in OK-land.

Experienced radio amateurs participate in almost all the big amateur-radio competitions and are always among high scorers. Club stations participating in world competitions often use special callsigns, the most esteemed being OK5MIR (OK5PEACE), showing the hopes of OK amateurs and the whole people of Czechoslovakia for world peace.

Czechoslovak amateurs participating in technical-cooperation missions often bring their equipment to developing countries. Some very rare prefixes are in this way made available to the whole amateur-radio community.

In daily, regular contacts, OK amateurs strive for friendly relations with all countries. The month of November was reserved for the Soviet-Czechoslovak competition during which friendly messages were exchanged between OK-land and UA-land operators.



FEDERAL REPUBLIC OF GERMANY

Ralf Beyer DJ3NW
Opferkamp 14
3300 Braunschweig
Federal Republic of Germany

RFI

Almost everyone has had his experiences with broadcast/television interference and with its reduction or complete elimination. But I suggest also looking at interference to ham radio which arises from leaking TV sets, noisy computers, insufficiently-filtered dimmers, and other sources. Recant experiences in this field got me interested in the broader aspects of RFI. Fortunately, I found that a rather systematic approach to the problem exists, at least in our country.

First, there is the German FCC, and one of its offices issues the so-called FTZ number. This number is awarded to communications equipment, domestic or imported, if it meets certain specifications regarding noise immunity against external sources, as well as low emission of signals which might cause interference with other sets. These specifications have been tightened more and more in the past, and without going into their details, I will give you an example of their real-life effects.

Having my ham-radio and TV antennas mounted on the same mast with a separation of only 2 meters, 100 Watts of transmitter output caused a complete loss of the TV picture and sound with a TV set produced around 1980 which had the (old) FTZ number Z385C. Furthermore, this TV set generated hash noise on 20 meters on the order of 25 microvolts at 50 Ohms (S8 on the meter). This was apparently caused by its switching power supply and occurred even when the TV set was in standby mode. Newer TV sets can be awarded the FTZ number 22/585/SE-VT, for example, if they meet the much tighter BCI/TVI specifications of today.

The replacement of the old TV set by a new one with a current FTZ number resulted in no or negligible TVI for the same arrangement of TV and ham-radio antennas and in a reduction of hash noise on 20 meters far below the S1 mark. Because radio and TV sets with lower-grade RFI specifications still can be sold, it is worthwhile to inform your neighbors and others about the up-to-date FTZ numbers (or similar designations in your country) before they procure a new set. In every case, it is to their advantage because our FCC, for example, does not pursue RFI cases if equipment with outdated FTZ numbers is involved.

Next, there is the RFI-filter industry. They are offering excellent antenna filters, line filters, and loudspeaker filters for the consumer products experiencing interference. Plug-in high-pass filters for TV sets with a stop-band attenuation of more than 50 dB and with an insertion loss of less than 1.5 dB are very efficient and popular. Sometimes, however, common-mode voltage problems (i.e., identical phase of the ham transmitter signal on the shield and the inner conductor of the TV coaxial cable) can render their application useless. Therefore, common-mode rejection transformers also are offered which are installed ahead of the high-pass filter so it can operate as designed.

One of my neighbors took my advice, bought two high-quality commercial high-pass filters, installed them ahead of his old VHF/UHF antenna amplifier, and cured the TVI problem completely for a total cost of 35 dollars. The FCC, by the way, investigated the case but did not pursue it because the antenna amplifier had no current FTZ number.

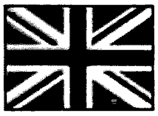
Information on RFI suppression products can be obtained from the Auth Company (distributor: Fritz Hoahne DJ4FT, 4830 Bochum-Hiltrop, Weg am Koetterberg 3) or from Karl E. Schertler DJ0AV, Hoehenkirchener Weg 5, 8127 Iffeldorf, Federal Republic of Germany. The latter supplies also the common-mode rejection transformer.

Furthermore, the national amateur-radio association (DARC) is providing a special service for its members. In addition to technical advice, it has procured at least one set of industrial RFI filters/transformers to be stationed in each state of Germany. Members of the DARC can borrow this set for a moderate fee in order to determine the most efficient way to eliminate RFI. This has the additional advantage that one needs to purchase afterwards only what is really required. I think this idea is applicable everywhere a larger group of hams can share a seldom-used piece of test equipment.

The next challenge, which is already with us, is from noisy computers and video games. Many of them are not state-of-the-art regarding their RFI properties. But rather than putting much effort in quieting often already-obsolete computers, I consider it more efficient to purchase new products without RFI problems. The Commodore CBM 64 personal computer is one example. Tests showed that it did not produce any RFI standing next to shortwave and 2-meter radio equipment and that it was immune to transmitter signals, too.

I am not considering the shielding and filtering at the ham transmitter site because I feel that state-of-the-art ham-radio equipment does not produce stray emissions which are significant in this context. In most cases, it is the (sometimes high-power) fundamental emission of our transmitter which causes interference in consumer products. These are designed at low cost and therefore often lack appropriate measures against RFI. Therefore, a great deal of our RFI reduction effort must be invested here.

In summary: In dealing with RFI problems, I think we are in a fortunate situation. We have a competent and respected FCC defining and upgrading RFI standards, an industry which offers a broad line of RFI-suppression products, an amateur-radio organization providing tools for the investigation of RFI cases, and an almost unlimited choice of consumer products like computers, radio/TV sets, video games, electronic organs, etc., with often similar performance but sometimes different RFI characteristics. It is up to us to make the best use of it. In the long run, it will be most efficient to promote the purchase of consumer products known to be RFI-resistant and noise-free in the private as well as in the business sphere. Nevertheless, the RFI-filter industry still will have bread and butter for years to come.



GREAT BRITAIN

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THE UK SCENE

The impending arrival of cable television in the UK may not cause the interference problems to radio amateurs that have been the case in the United States, with leaky cables and poor joints radiating in the 2-meter and other bands.

The guidelines for prospective CATV franchise holders published recently by the Home Office specified a number of prohibited frequencies and others with strictly limited radiation levels. The prohibitions apply only to military allocations; however, the 145-MHz (2-meter) and 430-MHz (70-cm) amateur bands are specified for a maximum emission from CATV systems of −26 dBmV.

Systems conforming to this are unlikely to cause too many problems to amateur stations. But for once, the news is better. BICC, the multinational cable-making and construction group with extensive interests in the development of cable television, has proposed a spectrum plan that recommends no signals of any level be propagated in either the 4m, 2m, or 70-cm bands—this even though 4m (70 MHz) is not a restricted zone.

The use of the 10-meter band for local or mobile FM is to be encouraged if only as a means of keeping this band occupied during the period of minimum sunspot activity and poor propagation. For some time, activity has concentrated around the de facto simplex calling channel (there are no 28-MHz repeaters in the UK) of 29.600 MHz.

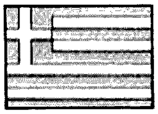
However, the situation shows signs of generating problems for other longer-established 10-meter users. CB rigs covering 27.6–28 MHz (and using the UK modulation requirement of FM) are readily available and readily convertible to cover a large portion of the 28-MHz band in 10-kHz steps (they also provide a path to 10-meter FM that is cheaper by several orders of magnitude than purchasing a custom ham kit).

The problem arises when the rigs are modified to cover 29.3–29.7 MHz, which includes the downlink for mode-A satellite working. Not only are signals from space usually quite weak, but being sideband or CW, they are difficult (usually impossible) to resolve on an FM rig. I have experienced an FM signal preventing the completion of a QSO via RS8, and with my limited power, only high overhead passes are really workable. I have tried waiting for the satellite to pass and then calling the FM station directly, but my SSB or CW signal is just regarded as interference!

An internationally-agreed recommendation for an FM subband (simplex and repeater) needs to be introduced before the situation gets out of hand.

I have mentioned previously my interest in RTTY. One aspect of RTTY listening that occupies a lot of shack time is the printing of meteorological bulletins (it really is amazing just how much information is transmitted around the world day and night). I even have a license to receive such transmissions, together with meteorological facsimile for which I am also equipped. And all for the princely sum of $7.00 *for life!*

I discovered only yesterday that the UK Meteorological Office transmitting from Bracknell includes, amongst reams of synoptic reports, some very accurate information relating to NOAA 7 and 8 orbits. I am currently seeking details for the decoding of this info which, unfortunately, is not given in the Meteorological Office "blue book," which is the basic decoding reference.



GREECE

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ARDF IN GREECE

ARDF in Greece is something unknown. So you might start wondering why I picked this subject for this month's column. Well, here is why, and I hope you will enjoy the story.

About one and a half years ago, Athens had only one VHF repeater (R1) and you can imagine how important it was for us. The repeater was working fine until the evening of August 15, 1982. The 15th and 16th of August were holidays, so everybody was out and the city was almost empty. On that evening, a steady carrier appeared on the repeater's input frequency and, of course, after three minutes the timer forced the transmitter to drop off. That was it. Athens' repeater was blocked.

It took us quite a while to understand what was going on, because on the one hand, the signal in the input wasn't that strong really, and on the other hand, such a thing had never happened before. With the darkness, there was nothing we could do.

Next morning, the repeater was still off, and after some phone calls, a group gathered at the area the signal was coming from—on the very same mountain the repeater is on. So SV1EM, SV1GH, SV1JZ, SV1OE, and SV1PH started searching for the intruder. In about one hour's time, they found it. It was a crystal-controlled oscillator on a small PC board with 8 C batteries, a stabilizing IC for the power supply, and a 1/4-wave whip for the antenna. The unit was very close to the main road leading to the repeater's site, behind a big stone.

This was the first taste of ARDF for Greek radio amateurs. Although there were many thoughts about the event, no more attention was paid to it until September 9, 1982.

On that day, R1 was in trouble again. This time the smart boys were even smarter. The carrier was on for 1/2 second every 3 seconds. R1 was on all the time. Imagine how it was to monitor the repeater waiting for a call, listening to the darned thing making like a machine gun. After our first surprise, we started turning the beams to locate the carrier, but there was nothing we could hear. The next day, a team consisting of SV1DC, SV1DS, SV1EX, SV1GH, SV1IW, and SV1KA were on top of the mountain again. If there was a place where you could hear the carrier, it was the repeater site itself. A 9-element beam was brought, and the direction of the carrier was marked on a map.

It was obvious that the signal was coming from outside Athens, but how far? We decided to cover as many areas as we could before dark. SV1AN and SV1AS were soon with us for a common effort. For three or four hours we were searching every place we could go, either driving or walking where driving was impossible.

With a big amount of luck, just a little while before dark we found the area of the beacon (within a square mile) some 10 miles outside Athens, and the next morning SV1AN, SV1DS, SV1GH, and SV1PA, along with two police officers, were in the area again. It took a little while to discover the device, which was hidden in a bush. This time the transmitter was commercial (the transmitting board of a Kenwood 2200 G portable transceiver). There was also a timer determining the on-and-off state of the unit. For the power supply, they had a truck battery with 145-Ah capacity! The whole thing except the antenna and battery was in an ice cream box.

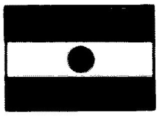
If you think that was all, you are wrong! Although for some time there were no problems, suddenly one day we heard again something feeding into the repeater's input. But, hmmm! This time it was a moving problem!

From that day, the signal was on almost daily, one time for one hour, some other times for two or three hours. Of course, R1 was off after the first three minutes. Our beams were useless since in Athens there is nothing you can do with all the buildings and the deflections on them. We had to find something else. So, we decided that every time there was a positive indication about a particular direction, a team with as many people as possible from nearby areas would search for the car with the beacon on. We chose some channels on the UHF band as links between the people who would be searching and the officials of RAAG, just in case some directions had to be given back and forth. If immediate action was needed, then the telephone was recommended.

As the days passed by, ten times we were close to finding the car, but always at the last minute the bird had flown. We were getting nowhere, when all of a sudden one evening I received a phone call from Gus SV1DC: "Come quick to the Glyfada's police station!" (The place is near the airport of Athens.) The next minute I was on my way.

Arriving at the police station, I found Gus waiting for me, and he explained shortly the situation. Earlier the same evening, Gus had been near the area for a job when he noticed the carrier at the repeater's input. So did SV1LA, who was very close to the area, and they started searching. Quite soon they located the source of the signal, which was not on a car but . . . on a motorcycle! At a glance I saw a 50cc Honda in the yard of the police station. A closer examination revealed some more details. The antenna was a small wire, almost invisible, coming through the windshield. The radio, a KDK 2050, was in a small box behind the driver's seat, and a small cable was transferring the PPT very close to the accelerator. Now it was clear why we couldn't locate the car. There wasn't any car to locate!

Now you are probably convinced that SV radio amateurs have a lot of experience in ARDF. Who knows, maybe there will be another chance to improve our experience in the future!



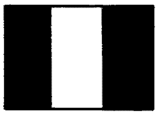
INDIA

Amateur Radio Society of India
10 Box 3005
New Delhi 003
India

NEWS FROM INDIA

During the three months of January, February, and March, 1984, a station with the commemorative callsign AT9A will be operative from the Antarctic. QSL info via Dr. Ashutosh Singh VU2IF, DXCC, PO Box 4015, New Delhi 017, India. Presently, "Ashu" VU2IF is on board the ship *Fin Polaris* (callsign OIGW), operating as VU2IF/MM on SSB around 14150 kHz.

Permission to operate commemorative callsign VU7WCY during December, 1983, was granted by our authorities, applicable to any VU station. Each station was to issue his OSL info upon reaching the Laccadive Islands. (Similar permission for the Andaman Islands operation has not been received, so far.)



ITALY

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ITALY'S ERE RIGS

Many of us could believe that the only producers of equipment for amateur use in the world are Japan and the United States. That's not right! In Italy, a small but very technically-advanced firm, ERE (Equipaggiamenti Radio Elettronici) produces state-of-the-art radio equipment for commercial, military, and amateur use.

The first ERE jewel is a rig called HF200, an HF transceiver for amateurs which boasts design ingenuities and on-the-air performance equal to many rigs made in Japan or in the US. This lightweight (6 kg) and compact (268mm W, 117mm H, 290mm D) transceiver is suitable for mobile or base-station use, and its price is really affordable.

The HF200 is completely solid state and may be completed with options like the AL-S/200 external power supply and speaker, the VFO 200E, and a solid-state 1000-W power amplifier, LHF-100ST.

The most interesting feature of the receiver is a revolutionary tuning system developed by ERE: The main tuning knob has a limited turning range clockwise and counterclockwise, and within this range it acts as a spread-band tuning knob. At the right and left end of the ranges the knob activates two microswitches which start an up or down frequency scanning, whose speed is selected through a slow-fast on-the-panel selector. The tuning frequency is read on a big digital display. The receiver is a single-conversion superhet, and the 9-MHz i-f is equipped with two eight-pole filters. The front end boasts very good overload resistance with the use of a high-collector-current rf transistor amplifier and Schottky-diode balanced mixer. The receiver is equipped also with af filters for CW and SSB and has an optional adjustable-level noise blanker.

The transmitter is also solid state, and the power-output keydown is 100 W.

This dynamic Italian firm produces also a very updated three-band (144, 432, and 1290 MHz) transceiver, the Kontact, which will be described in a future column, and a complete line of amateur-band antennas ranging from three- and four-band yagis and dipoles to an outstanding seven-element log periodic for 10- to 30-MHz frequencies.

For more information, you may write to Equipaggiamenti Radio Elettronici, Via Garibaldi, 115, 27049 Stradella, Italy.

HF200 SPECIFICATIONS

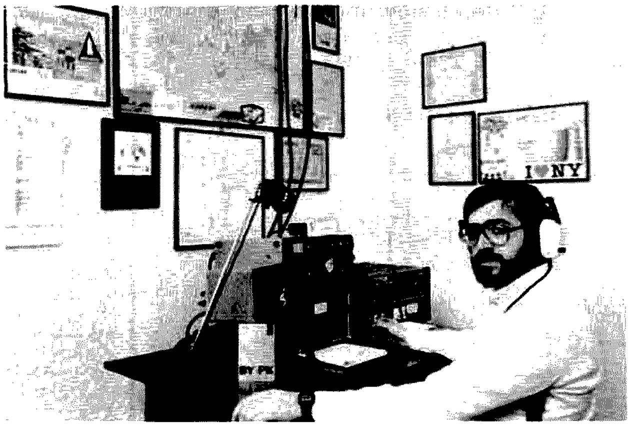
Frequency coverage	5 bands: 3.5–29 MHz (The latest models have provision for the new WARC bands.)
Receiver sensitivity	0.3 uV, 10 dB S + N/N
Receiver selectivity	SSB 2.4 kHz/ – 6 dB, CW 500 Hz/ – 6 dB with CW filter
Image attenuation	100 dB
I-f attenuation	100 dB
Intercept point	+ 2 dB at max sensitivity
Transmitter input power	200 W input K.d.
Carrier suppression	50 dB
Unwanted S-band supp.	50 dB

HAM RADIO IN SAN MARINO

The first active ham from the Republic of San Marino was the late M1A, Prof. Corrado Francini, who was followed by Mario Graziani M1B. Mario, in the post-WWII days, was active mainly on 7-MHz phone.

Following inquiries by amateurs in the United States, your columnist, who then had more hairs on his own head and held the call I1PL, together with his friend Stelio I1HR, made the first DXpedition in S. Marino and put for the first time the M1 call on the DX map. The expedition was a great success and made happy a big bunch of DXers. The number of QSOs was not astonishing, but we were in 1948 and we ran 60 Watts input into a random-wire antenna! "Never before has so much rf been pumped in one direction on one frequency in the 14-Mc band," had to remark *QST* in its 1948 October issue, reporting the great happening!

The tiny republic, 38 square miles, about 20,000 inhabitants, atop Mt. Titano in central Italy, claims to be the oldest republic in Europe, being established since 1231. Despite the fact that every stone and every mountaintop there recalls old stories of savage wars, knights, and lovely mistresses, the Republic of S. Marino has today an advanced economy with industries and commercial traffic, due to the initiative of its dynamic citizens. There is also a noticeable tourist



T77C (ex-M1C) in his shack.

traffic there; thousands of people come to visit the ancient monuments and to enjoy the wide vistas to the Adriatic Sea.

Amateur radio is also very active on Mt. Titano: it's ruled by the Telecommunications Department in the person of the Department Deputy himself, and by the Director of the Post Office. Just recently a proposal for official rules has been issued, which will be ratified soon.

Some years ago, the S. Marino hams founded the ARRSM (Associazione Radioamatori Repubblica S. Marino), which became a member of IARU January 30, 1981. The ARRSM president is the senior radioamateur of the group, Mario Graziani T77B (formerly M1B), and Tony Ceccoli T77C is the dynamic secretary.

(The old and unofficial prefix, M1, became the official T7 in April, 1983.)

Actually, there are 10 licensed amateurs in S. Marino, but there is also an eleventh station, the official radio club's T7ØA, dedicated to the memory of Corrado Francini M1A. This station will be active only once per year for some time and eventually, guest operators will be admitted only on an invitation basis.

The well known DX man Tony T77C (formerly M1C) is the most active HF operator from there. He is likely to raise tremendous pileups when his husky signal appears on the bands. Tony has been active for 10 years, and his log sports more than 82,000 QSOs, an average of 8.2K QSOs per year! That's not bad for a rare country like S. Marino!

Tony holds a 5BDXCC, a WAZ, and a WAS award; he needs only one card to be elected in that DX Olympus called Honor Roll. Everybody who has met him was delighted, finding a very friendly and modest boy. He is a real CW enthusiast, and his effort giving a new country to as many hams as possible around the world is confirmed by the fantastic number of 15,000 QSOs made in 1982!

L to R: T77B (ex-M1B), T77I (ex-M1I), T77Y (ex-M1Y), T77J (ex-M1J), and T77W (ex-M1W).

The T77C rig is a TS-820S followed by a kW home-brew amplifier, and the antenna is a rotary two-element delta loop for 10, 15, and 20 meters. He uses some dipoles for the LF bands and has started to experiment with the 160-meter band. Boys, keep your ears open for a very rare one on the top band!

Another very active ham from S. Marino is Peter T77V, who started his activity on the HF bands three years ago. He runs a TS-830S to a three-element tribander yagi and has also a 7-MHz loop and a 3.5-MHz inverted vee.

Two stations which are active on 144 MHz from Mt. Titano are T77J and T72ZR. Look for them, as their signals should have a very long span from those heights.

QSL cards for the S. Marino crew should be sent to the Radio Club S. Marino, Post Box n. 1, 47031 S. Marino Citta, Repubblica di S. Marino.

The addresses of the most active HF stations are: Antonio "Tony" Ceccoli T77C, Via Carrare, 67 Pennicciola, 47031 Repubblica di S. Marino, and Piergiovanni "Peter" Volpinari T77V, Via G. Giacomini 507/54, 47031 Repubblica di S. Marino.

Should you happen to travel in the neighborhood of Mt. Titano, please don't miss meeting the T77 boys. You will have a friendly welcome, and atop there you will enjoy ancient atmospheres, great sights, and last but not least, a great white wine together with fantastic Italian foods.

de IØXXR

BLUE TEAM DXPEDITION

It all started at the end of 1982 when the group of Italian DXers that founded the DX Blue Team under the presidency of Sergio I2JQ decided to organize a couple of expeditions: one for UHF and SHF and one for HF enthusiasts.

For the first choice, it was very easy to convince IØSNY to organize it. In fact, he went to North Africa and managed to get the world record on 1.2 GHz and on 10 GHz. On top of it, he gave to many Europeans a new one from EA9, and from CN on 432 and 1.2 GHz.

More problems were found where HF was concerned. It was difficult to find a place not too difficult, from a logistical point of view, and interesting enough for the DX community. We managed to choose three countries and started to work on getting the authorizations to work from there. The BV authorities replied to us granting permission for a 10-day operation from Taipei and offering us the assistance of the CRA.

BV represents a really good target for many DXers, and we happily started to work on it. The story of the preparation of the trip is long and not too interesting, but at the end of it we were on a plane that was landing in Taiwan.

Custom problems didn't allow us to clear the goods immediately so we left the equipment in a bonded warehouse and met for the first time Tim Chen BV2A/B at the Taipei international airport. It was Sunday afternoon, September 18, and Tim's warm welcome was a prelude to all the assistance that he was ready to give us, and he really did it.

At the hotel another surprise: a group of members of the China Radio Association was waiting for us. It was our idea that Tim was the only ham in BV—not only the only active one, but also the only one interested in radio! That was not true. We had the opportunity to meet a few oldtimers and a few young fellows waiting for the local authorities to release more licenses.

On Monday, September 20, after getting all the papers to clear the rigs and be allowed to operate, we were able to put up a 12AVQ and start operations. The propagation was not too good up to midnight, local time, when the band opened to Europe, and we had the opportunity to work a few hundred stations.

On the 21st, I was in charge of the operations and, after putting up a 2-element tribander, I started to work Japan on 15. In the afternoon, the band was starting to be very good on 20. I had a good opening with VK and ZL and later on with South America. It was like being able to see the grey line moving from the South Pacific to the lowest part of the American continent and then up to the Caribbean area.

After that the first signal from the United States, Bill K1MM calling me. I worked him and a few others, but not too many Ws were on frequency. Bill called me again and told me that he was passing the message on the local repeaters, so it was just a matter of a few minutes to get a

Continued on page 132

T77C's 2-element delta loop antenna.

In the shack are BV2B, Marco I2NYN, Mario I2MQP, and Enzo I2BVS.

Ed Landefeld W8DCC
1135 Durham Circle
Massillon OH 44646

Take the Two-Tone Challenge

*Does your transmitter put out a clean signal?
Build this two-tone audio generator and find out.*

A "Two-Tone Test" is generally acknowledged to be the most convenient and accurate method of checking the adjustment and operation of an amateur SSB transmitter. Improper bias, nonlinearity, overload, and spurious oscillations are all revealed by this method. Two-tone testing also has the advantage of testing the whole system from microphone to antenna. If there is no frequency instability, a transmitter showing a good two-tone test is almost certain to radiate a high-quality signal.

A two-tone test signal can be produced with a single audio tone by inserting the proper amount of carrier to provide the beating frequency. This arrangement is somewhat awkward at best, and many transmitters have no convenient provision for inserting specific amounts of carrier in the SSB mode. An audio generator that will produce two audio tones and can be plugged into the microphone jack is an excellent method of setting up for this test. Such a generator is not complicated or expensive; it can be constructed in an evening or two, and every part and piece is available at your local Radio Shack store.

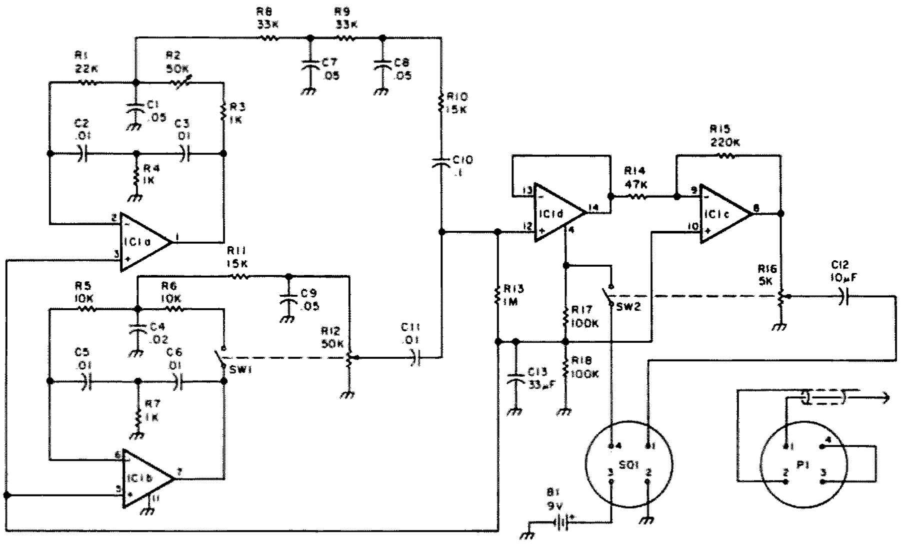


Fig. 1. A versatile two-tone generator.

Circuit Details

The only active circuit element in the generator is IC1, an LM324 quad op amp. One section of the chip (IC1A) is connected as a twin-tee audio oscillator. This is a very simple circuit, the basic oscillator consisting of the op-amp section, three capacitors, and three resistors. The 50k potentiometer, R2, is used to vary the frequency of this oscillator over the range of 440-1750 Hz. The 1k resistor, R3, places a lower limit on the effective resistance of R2. This ensures that the oscillator will run at all settings of R2.

This rudimentary method of changing the frequency of the oscillator by varying only one resistor results in the oscillator output increasing in amplitude as the frequency is increased. Ad-

vantage is taken of this characteristic in the double-section RC filter following the oscillator. The filter cleans up what distortion is present at the oscillator output, and the increasing attenuation of the filter at the higher frequencies compensates for differences in oscillator level. The result is a nice sine wave of nearly constant level at the output of the filter.

The second section of the chip (IC1B) repeats the circuit of the oscillator just described but without the variable frequency feature and with circuit values selected to give a fixed frequency of 1775 Hz. A single-section RC filter is used for this oscillator. This results in less attenuation, ensuring that the signal level on the balance potentiometer, R12, is always greater than that of the first oscillator. R12 is used to set the amplitude of the second oscillator to equal exactly that of the first oscillator.

The signal from both oscillators is now applied to the noninverting input of op-amp section IC1D. This section is connected as a voltage follower. It provides no gain but has a very high-input impedance. The voltage follower is followed by an amplifier stage (IC1C) to raise the level to the output connector.

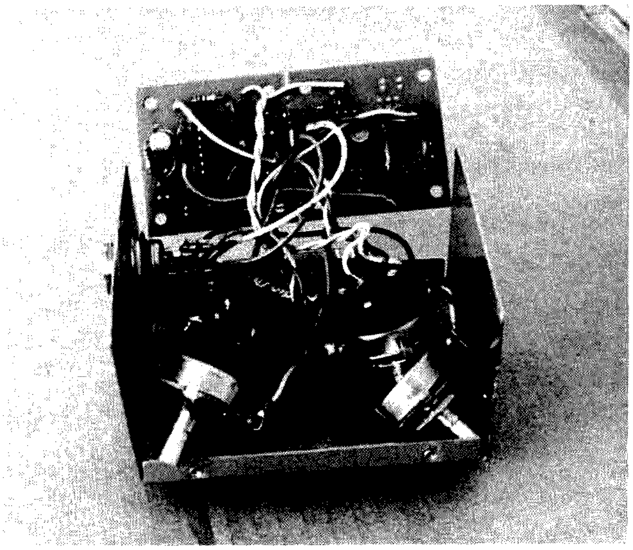
The second oscillator has a switch, SW1, ganged to the balance control. When the balance control is turned fully to the off position, opening SW1, the second oscillator is disabled while the first oscillator output is still available at the output connector. It now functions as a normal audio generator over its frequency range. This additional feature is quite useful as the waveform is good, with a maximum output level of 400 mV peak-to-peak.

Construction

The generator was constructed on a printed circuit board available at Radio Shack stores. (They list it as a "Dual IC board"; see Parts List.) Since this board is very slightly too long to fit properly in the housing specified, it is suggested that about 1/32" or so be filed from each end of the board before construction is begun and the board fitted to the housing.

At these frequencies, layout is not critical. The board has provision for two 20-pin integrated circuits. As we are using only one 14-pin chip, there are plenty of tie points to which to run component leads. I found it convenient to mount the socket and position the chip so that pins 1 through 7 were toward the center of the board. As the two oscillator sections have the greatest component density, this positioning allowed the oscillator components to spill over to the otherwise-unused section of the board. There are enough pads and holes to give each component lead a home, and with a little planning ahead, a neat layout can be achieved.

A few words for the inexperienced: In planning the layout, make an effort to have the physical components follow the layout of the schematic as well as you can. This makes troubleshooting less confusing. Although it is nice to see all resistors lying flat on the board, do not be afraid to mount them vertically if it is convenient or will improve the layout. With discretion, bare-wire jumpers may be used on the solder side of the board. For example, a wire jumper from pin 5 to pin 10 on the solder side of the board saves going all around the chip. I dedicated one of the center traces as a ground bus. Stranded wire is needed for the runs to the controls. The holes around the edge of the board are larger than the holes for components. Try to arrange to have the stranded wire to



Component side of board, ready for assembly.

the controls go to these larger holes. Don't be ashamed of a few jumpers to get from here to there. When using an all-purpose board like this, a few jumpers are hard to avoid.

After all the soldering is done, there will be a considerable accumulation of rosin on the board. I scrape the heavier portions away with a small screwdriver and then spray the board with Rosin Flux Remover from Radio Shack (RS 64-2324). I use an old toothbrush to scrub away the remaining rosin and wipe the board dry with a cloth. You will be surprised at how much better the board looks. It is also much easier to spot solder bridges and poorly soldered connections when you have a nice clean board.

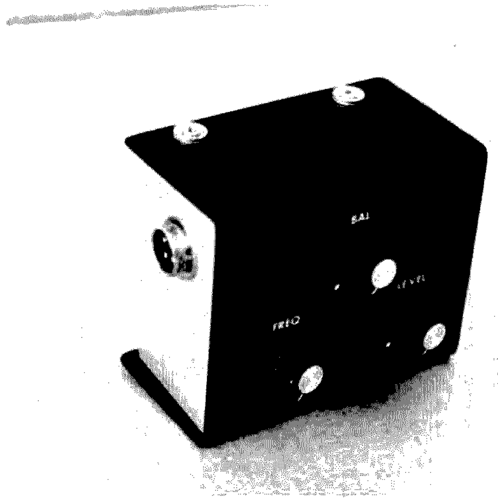
The physical construction requires little explanation. I used only two of the mounting holes on opposite corners of the board to mount it. I tapped the holes in the bottom of the housing and mounted the board on spacers, cutting the 6-32 screws to length so that they would not protrude more than a couple of threads through the bottom. If you use the potentiometers specified from Radio Shack, note that the mounting bushing is only 5/16" instead of our standard 3/8".

With the connector I used, there is no automatic grounding of the chassis. This allowed hum pickup, particularly while testing, when the chassis was separated. To alleviate this, I ran a wire ground to a lug on the screw holding the battery-clamp to ground the bottom section, and a short bare wire from the ground lug on a potentiometer, soldered to the shell of the potentiometer, to ground the top, or panel, portion.

The board specified is a very nice board. It solders well and seems quite rugged. With reasonable care, it is possible to remove and reposition components several times without any tendency for the copper to separate from the board.

Checkout

After the soldering has been completed and the board has been cleaned, the usual physical inspection for solder bridges and poor connections can be made. Before installing the battery, an ohmmeter check for a short on the supply rail is a wise precaution. With the battery installed, a voltage check on the IC socket will confirm proper supply polarity. Note that as the cir-



The finished product.

cuit is drawn, no power will be supplied to the board unless P1 is in place.

The IC can now be installed. With the level control full on and the balance control fully counterclockwise, a sine wave should appear on the output connector. If no scope is available, a pair of headphones may be used to confirm output. The tone should sound "smooth" and relatively low-pitched at one extreme of the frequency control, rising to a much higher pitch with the frequency control at the other extreme.

Advancing the balance control will cause the signal to become louder and change in character. If a scope is being used, the presence of both tones will be noted. Advancing the balance control to maximum should cause the scope pattern to more than double in height.

Should the generator fail to work, some troubleshooting is in order. The LM324 is a nice chip to troubleshoot since the output of each section is on the corner of the chip. A dc-voltage measurement should show the active pins of each amplifier section near half the supply voltage. A pair of high-impedance headphones with a capacitor of .1 μF or so in series with one of the leads makes a fine poor-man's signal tracer. There is nothing fussy about the circuit; it will work if there are no wiring errors or defective components.

Using It

A two-tone test is quite simple to set up. Use the monitor scope or service scope coupled to the output of the transmitter. Adjust the scope pattern for a convenient height while transmitting full-carrier. Now plug the generator into the microphone jack and key up the transmitter in the SSB mode. With the microphone gain at its usual setting, advance the level control on the generator to produce a scope display somewhat less than that obtained with the full carrier. With the balance control about mid-position, adjust the scope sweep or the generator-frequency control for a steady display. Adjust the balance control to achieve a sharp crossover between the individual cycles of the wave. Advancing the generator-level control will increase the height of the pattern until the tips of the waves just reach the height obtained when the carrier had been sent. Further increasing the level control should show flat-topping of the tips of the waves.

A scope will not synchronize as solidly on a two-tone test as it will on less complex waveforms. A change in level often will result in the pattern "running." As the audio generator is usually close at hand while the scope may be several

Parts List

C1	.05 μF, 50 V	RS 272-134	2/49¢	.25
C2	.01 μF, 50 V	RS 272-131	2/39¢	.20
C3	.01 μF, 50 V	RS 272-131	2/39¢	.20
C4	.02 μF, 50 V (two .01s in parallel)	RS 272-131	2/39¢	.39
C5	.01 μF, 50 V	RS 272-131	2/39¢	.20
C6	.01 μF, 50 V	RS 272-131	2/39¢	.20
C7	.05 μF, 50 V	RS 272-134	2/49¢	.25
C8	.05 μF, 50 V	RS 272-134	2/49¢	.25
C9	.05 μF, 50 V	RS 272-134	2/49¢	.25
C10	.1 μF, 50 V	RS 272-135	2/49¢	.25
C11	.01 μF, 50 V	RS 272-131	2/39¢	.20
C12	10 μF, 35 V	RS 272-1025		.59
C13	33 μF, 16 V	RS 272-1426		.69
IC1	LM324 quad op amp	RS 276-1711		1.49
P1	4-pin connector	RS 274-1		1.59
R1	22k, ¼ Watt	RS 271-1339	5/39¢	.08
R2	50k linear taper potentiometer	RS 271-1716		1.09
R3	1k, ¼ Watt	RS 271-1321	5/39¢	.08
R4	1k, ¼ Watt	RS 271-1321	5/39¢	.08
R5	10k, ¼ Watt	RS 271-1335	5/39¢	.08
R6	10k, ¼ Watt	RS 272-1335	5/39¢	.08
R7	1k, ¼ Watt	RS 272-1321	5/39¢	.08
R8	33k, ¼ Watt	RS 271-1341	5/39¢	.08
R9	33k, ¼ Watt	RS 271-1341	5/39¢	.08
R10	15k, ¼ Watt	RS 271-1337	5/39¢	.08
R11	15k, ¼ Watt	RS 271-1337	5/39¢	.08
R12	50k linear taper potentiometer	RS 271-1716		1.09
R13	1 meg, ¼ Watt	RS 271-1356	5/39¢	.08
R14	47k, ¼ Watt	RS 271-1342	5/39¢	.08
R15	220k, ¼ Watt	RS 271-1350	5/39¢	.08
R16	5k linear taper potentiometer	RS 271-1714		1.09
R17	100k, ¼ Watt	RS 721-1347	5/39¢	.08
R18	100k, ¼ Watt	RS 271-1347	5/39¢	.08
SO1	4-pin chassis socket	RS 274-2		.99
SW1	Potentiometer switch	RS 271-1740		.69
SW2	Potentiometer switch	RS 271-1740		.69
B1	9-volt battery	RS 23-583		1.19
1	14-pin DIP socket	RS 276-1999	2/89¢	.45
1	Battery connector	RS 270-325	5/99¢	.20
1	Dual IC board	RS 276-159		1.49
1	Utility cabinet	RS 270-251		2.99
3	Knobs	RS 274-415	4/1.59	1.20
				$21.36

feet away, it is convenient to adjust the frequency control on the generator to stabilize the pattern. Running the frequency control over its range will result in a number of patterns on the scope. They are all equally useful except when the two tones are harmonically related.

There is sufficient output from the generator to severely overload most microphone amplifiers. It is good practice to leave the microphone gain control set where it is normally used and to use the level control on the generator to set the level.

For those not familiar with two-tone test patterns and their interpretation, a page of pictures and a description of the test procedure is given in *The Radio Amateur's Handbook*. You should obtain a textbook pattern. Any departure from the proper display should be investigated.

As mentioned earlier, the generator can be used as a sine-wave audio source by turning the balance control fully counterclockwise. This feature can be quite useful to the ham who cannot justify the cost of an audio generator but who finds occasional need for an audio source. The frequency range, though restricted, does cover the range of frequencies most commonly used.

In Conclusion

I am quite pleased with the operation of this generator. I had gotten tired of rigging two audio oscillators to make checks on my homebrew SSB rig. Setting up for a test is now a snap! I also find that the ability to steady the scope pattern with the frequency control is very handy since my monitor scope is several feet from the rig. Add to this the economy of only 1-mA current drain and a total parts cost of under $25.00, and you have a useful gadget at a very attractive price. ■

✓See List of Advertisers on page 114

Build the NASA Beeper

Space-wise communicators use this device for one good reason: clarity.

Nicholas Van de Sande KQ4C
18 Spring Valley Drive
Arden NC 28704

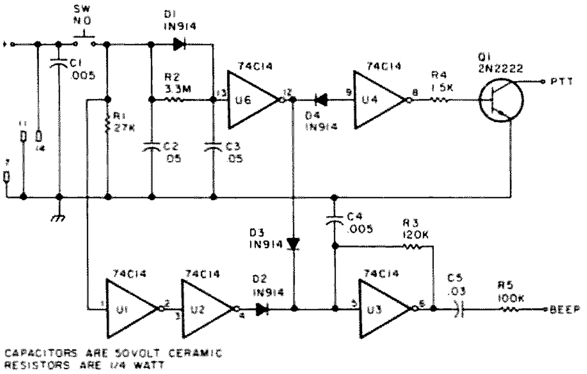


Fig. 1. Beeper schematic.

About three years ago, a friend sent me a circuit for a beeper that was being used in the Netherlands and by some of the ex-PA hams in the western hemisphere. It is used to insert a short tone at the end of a phone transmission, much as that used in communications with the astronauts. It was called the "Apollo Beep."

With the QRM we have on our crowded bands today, it is sometimes difficult to know when the other op has turned it over to you, and a beep can help. This beeper modulates fully, to the same level as a CW dash, and it stands out like the well-known sore thumb.

After constructing the beeper, I found that it worked quite well and accomplished its design purpose. I found this version rather cumbersome, however. It used six transistors, quite a few resistors and capacitors, plus a large capacitor across the transceiver-transfer relay to hold the carrier on until the tone had been transmitted. In some cases, a separate relay on the beeper board was used for this purpose, but the same objections still applied.

In the October, 1979, issue of *Ham Radio*, there appeared a circuit for a "K generator," designed by G8KGV. It inserted the letter K at the end of transmission. Shortly thereafter I built and installed that circuit, and it worked very well.

After some use, however, it seemed to me that this was gilding the lily. It seemed overdone. Also, several times the other op said to me, "I think there is a CW breaker in there!" Then it dawned on me that he thought my K was coming from elsewhere!

Back to the drawing board! After some head scratching and circuit-book consultation, the circuit shown here evolved. It requires only one IC (74C14), one transistor, 4 diodes, five resistors, and five capacitors.

Let's see how the circuit

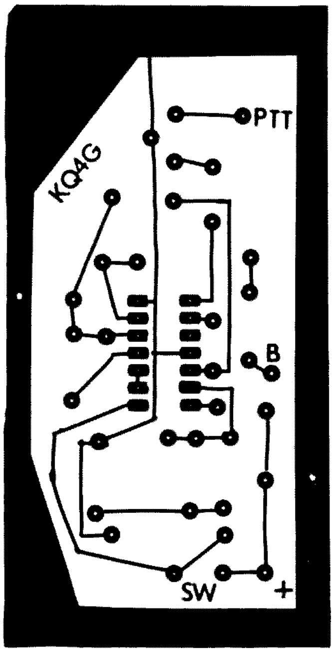


Fig. 2. Circuit board.

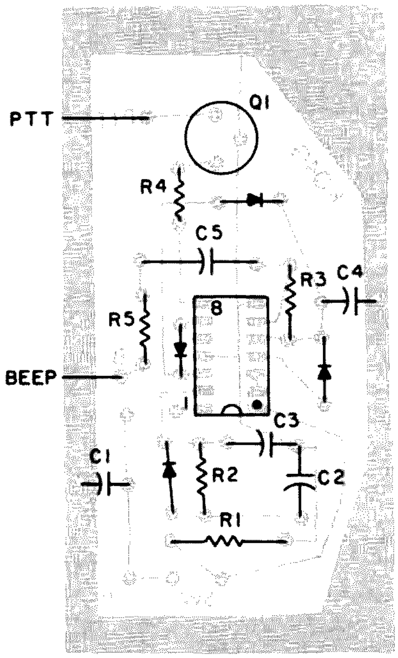


Fig. 3. Parts placement.

works. When the switch is closed, positive voltage immediately is applied through diode D1 to U6, pin 13, and C3. U6 output goes low, U4 output high, and Q1 conducts, turning on the transmitter via the PTT line. At the same time U1 output goes low, U2 output goes high. U3, a relaxation oscillator, will not operate unless both D2 and D3 inputs are low. Therefore, at turn-on no tone will be generated.

When the switch is opened C3 discharges slowly through the 3.3-megohm resistor, R2, thus holding U6 and D3 low for a short time. Simultaneously, U2 output goes low and U3 oscillates for approximately one-half second, at which time C3 has discharged sufficiently to allow U6 output to go high and U4 output low, and Q1 shuts down and we are back in receive mode.

The use of the 74C14, a CMOS hex-inverting Schmitt trigger IC, allows the use of almost any supply voltage between 5 and 15 volts. Mine operates from a separate 10-volt supply that feeds several other auxiliary units such as an audio filter, electronic keyer, preamp, etc. The voltage can probably be taken from the transceiver. R5 may need to be changed to meet your audio-input level.

I feed the tone into the "phone patch in" on my TS-820. It can be fed into the normal mike input in parallel with your mike.

The circuit board is small and can probably be mounted in the transceiver. Bypass the switch leads with .01 capacitors to prevent rf causing erratic operation—although I have had no such problem.

This unit has worked without fail since installation and has been a pleasure to use. Questions will be answered if accompanied by an SASE. I'll be beeping you! ■

George Brown WB4CHZ
186 E. Brooks
Memphis TN 38109

Sky Power

If you're a meteor-shower expert, don't read this. Otherwise, learn.

It's mid-August and two in the morning. With work only six hours away, the amateur radio operator creeps into the radio shack and begins flipping the switches that turn night into day inside the tiny room. Slowly the receiver is tuned to the agreed-upon frequency, the transmitter is adjusted, and the time is checked with WWV. Then the ham listens.

Nothing is heard, so he transmits during the allotted time; then he listens. Again nothing heard—but wait... out of the receiver comes a quick burst of CW: *de N4* ...The amateur carefully tunes the signal and again he hears CW: *de N4ABY/7*... With this rapid burst of radio energy, the receiving amateur springs to life; all thoughts of the time and the coming workday dissolve as he embarks on a meteor-scatter contact on two meters.

This is a typical scene at the homes of many VHF operators throughout the world during the annual Perseid meteor shower. I believe, however, that this scene should take place many more times during the year. As many of you may not be aware, there are several other opportunities each year to bounce your 50-MHz, 144-MHz, 220-MHz, and even 430-MHz signals off the trails left by meteors.

As a matter of fact, it was not even the Perseid shower that produced the very first 144-MHz meteor-scatter contact. Paul Wilson W4HHK reports that he made that very first two-way with W2UK 30 years ago. Wilson said, "In August we had a so-so contact, but it was not counted. Then in October, on one of the lesser showers, we did make a satisfactory two-way contact."

In all probability, this lesser shower that Wilson speaks of was the Orionid meteor stream.

Since meteor scatter can be a very productive form of long-distance VHF communication, you may wonder why it rarely takes place except during the Perseids. The answer to this question is quite simple: This shower is considered the best of the year in terms of the number of meteors occurring each hour and it provides the highest chance of a successful contact. However, there are a number of other showers almost up to the standards of the Perseids.

Meteor showers occur at a variety of times throughout the year. In fact, there are some 600 showers or streams known to exist. However, not all of the events are of use to radio amateurs. To be useful, the date of the shower peak should be known and the number of meteors occurring each hour should be rather high. After all, there is no point in trying to work meteor scatter when there are no meteors.

So we find that the Perseids are just one of many showers taking place each year. These showers occur when the Earth encounters chunks of nickel-iron and rock that are orbiting the sun. When one of these pieces of material (called a meteoroid while still in space) strikes the atmosphere of the Earth, friction between the meteoroid and the air causes the material to heat up and bum.

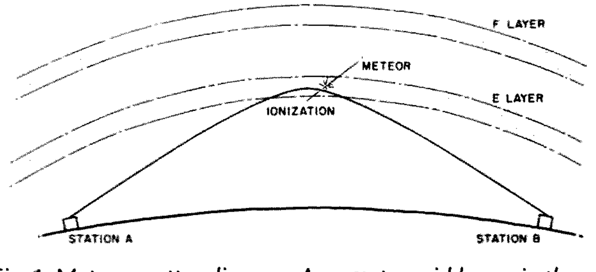


Fig. 1. Meteor-scatter diagram: As a meteoroid burns in the atmosphere of Earth, it leaves an ionized patch in its wake. If the ionization is intense enough, it may be capable of reflecting VHF signals, as shown here.

For the skywatcher, it is the tiny pieces of glowing material that are of interest since they are what produce the "falling stars" seen at night. But to the ham, it is the aftereffect of the meteor that causes the excitement.

As the meteoroid penetrates the Earth's atmosphere, it leaves behind an ionized trail that is sometimes capable of reflecting VHF radio signals. By bouncing signals off these trails, amateurs succeed in making meteor-scatter contacts. When attempting these contacts, hams should remember an important point: The frequency of the signal a trail is capable of reflecting is directly related to the density of the ionization.

Unfortunately for VHFers, it takes quite a meteor to produce enough ionization to reflect signals on 144 MHz and above. This is why attempts at meteor contacts occur during times when large numbers of meteoroids are entering the Earth's atmosphere—in other words, during a meteor shower. Fortunately, though, there are several chances each year to try to make these exotic contacts.

Of the 600 or so meteor showers that take place each year, there are seven events which may be of value to the VHF operator. While some of these showers are marginal, all should be capable of producing at least some contacts, and if you only need that "one more state," it may be worth your time to make a schedule on one of the dates mentioned.

During January of each year, the Quadrantid shower peaks on the 4th day of the month. This is a very short-lived shower, with the rise, peak, and drop-off taking less than one day. This very quick peak means you will have to be at the right place at the right time to take advantage of these meteors; however, of a more positive nature is the fact that this event produces about 40 meteor trails each hour.

The months of February, March, and April are relatively dull so far as meteor showers are concerned, but May takes a turn for the better. On the 4th of this month, the Eta Aquarid shower reaches its peak. Considered the best shower of spring, the peak varies slightly in time and the wise operator will schedule contacts for the 3rd and 4th. The point of origin of these meteors will be on the horizon at about 2:30 am, and there should be about 20 shower trails appearing each hour.

In June, there is a meteor shower that is not of much interest to astronomers but is potentially of great interest to amateur radio operators. The Beta Taurids, which peak on June 29th, produce a daytime meteor shower. This means that it is impossible to see the peak of the shower, but it is possible to utilize the peak for VHF communications. The best chance for catching these objects will be between 7:00 am and 12:00 pm local time. During these hours, the radiant of the shower will be rising in the east and moving to a point high in the southern sky.

After the Beta Taurids, it is almost exactly one month before the next good opportunity for meteor-scatter contacts comes along. This next chance is with the Delta Aquarid shower which peaks on July 28th. This shower should be considered seriously for meteor schedules since normally about 25 meteors occur each hour during the height of the event. In addition, contacts may be made one day before or after this shower's maximum since it is not sharply peaked.

The granddaddy of all meteor showers, the Perseids, takes place during August, and all meteor-scatter enthusiasts should be poised at their rigs ready to make contacts. The Perseids peak on the 11th, and between 50 and 60 meteors fall each hour. Like the Delta Aquarid shower but on a much grander scale, this is a rather long-lived event, and contacts should be possible one or two days before and after, maximum.

After the Perseids, nature takes a short break before it provides another really good shower. This comes in October, which offers a meteor stream that is notable for at least two reasons. First, this is the shower used initially for a two-meter meteor-scatter contact, and second, the meteors seen during this shower originate in the famous Halley's Comet. On October 20th, the night the Orionid shower peaks, VHFers can expect about 30 meteors each hour as the radiant rises in the southeastern sky.

Finally, December will provide the last big meteor shower of the year, but fortunately the year does go out with a flash. The Geminid meteor stream reaches maximum on December 14th, and it is always quite a spectacle for interested skywatchers. Since the shower produces almost 60 meteors each hour, it should also prove quite spectacular from a communications viewpoint. So, while the astronomers cool their heels watching for the meteors in the cold December weather, amateur radio operators should be able to make a few contacts in the warmth of their finals.

It is apparent, then, that there are many opportunities during the year to make a number of meteor-scatter contacts, and for the experienced operator, all that is necessary is to make schedules with other amateurs. But what if you have never made a meteor contact or don't even know what one sounds like?

The best approach is to find some ham who is making schedules and see if you can be in on some of the contacts. However, if no one in your area is active on meteor scatter, the next best bet is to find someone through one of the VHF-oriented publications or columns and make a schedule of your own. If the person you contact is an experienced operator, you should be able to get all the necessary information regarding proper procedures and techniques.

It should be apparent by now that meteor scatter can and should be a year-round activity. Those who have tried this mode of long-distance communication have found it to be quite exciting and very challenging, and for these amateurs, I hope the information provided will allow them more operating opportunities during the year.

For the beginner, I hope the knowledge that meteor scatter is not a one-time-a-year operation will provide the motivation to actually get on the air and make contacts. But remember, don't blame me for sleepless nights and rough days at work; blame Mother Nature for providing all the meteors! ■

Shower	Date	Remarks
Quadrantid	January 4	Very short-lived shower
Eta Aquarid	May 4	20 meteors each hour
Beta Taurid	June 29	Daytime shower
Delta Aquarid	July 28	Contacts possible ± 1 day
Perseid	August 11	Best shower of the year
Orionid	October 20	Originated in Halley's Comet
Geminid	December 14	Nearly as good as Perseid

Table 1. Shown here are the names of meteor showers of interest to amateur radio operators, the dates the showers peak, and comments concerning them.

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Wet Battery Quiz

And you thought you knew it all.

There is not much to ordinary wet batteries, is there? I mean, doesn't everyone know that all you do is charge them and discharge them? So you won't find this quiz a challenge? Right, so let's see how you do.

Here are ten statements. All refer to automotive-type storage batteries. Mostly they refer to batteries powering light loads—such as electronic equipment. Answer yes or no.

1. The best way of establishing state-of-charge of a battery is with a hydrometer.
2. An inactive battery should be kept on trickle charge.
3. A 100-Ampere-hour battery can be discharged at 10 Amperes for 10 hours.
4. You cannot tell the state-of-charge of a battery by measuring its terminal voltage.
5. Batteries stored on concrete floors will be damaged.
6. Initial voltage and open-circuit voltage are the same thing.
7. If the specific gravity of an older battery is low, add battery acid to bring it up to 1.300.
8. Only "marine" batteries should be used on boats.
9. Connecting two batteries in parallel will double the power available.
10. Impregnated felt washers on battery terminals will prevent battery corrosion.

Nothing to it, right? Want to try your answers against mine? Read on.

Batteries are interesting, even fascinating, perhaps because so little is known about them—or maybe because so much is "known." Every writer has his own rules and opinions. In a situation like this, it is wise to balance theory against practical experience. So that is what these answers are based on—a synthesis of "book larnin" and practical experience.

1. Hydrometers. Most books have this old chestnut—and it is true as long as you are talking about new batteries. However, as a battery ages, it loses its ability to raise its specific gravity, no matter how long it is charged. This does not mean that the battery will no longer serve its purpose. In addition, the hydrometer is a hazardous nuisance.

Battery acid is highly corrosive and its corrosive power lasts a long time. The better way of identifying level-of-charge is by combining battery voltage and current readings.

If either voltage or current can be regulated—that is, kept constant—then the second factor will indicate full charge when it reaches a constant value for one hour.

As a practical example, an ordinary 6-Amp unregulated charger will have fully charged the battery when terminal voltage reaches about 14½ volts.

Another indication of full charge is the amount of bubbling (gassing) you can hear from the battery. Stop the charge when bubbling becomes obvious.

2. Inactive batteries. Before the day of "dry-charged" batteries, ready-for-sale batteries in stores were kept under constant trickle charge. Some authorities today are against trickle charging on the grounds that it causes "sulphation." In other words, battery capacity will decline due to formation of inactive material on the plates.

My own experience is that as little as ½ Ampere will cause the electrolyte to boil away in a couple of months. We have to qualify this theory with the experience of North American telephone companies. The telephone companies have more batteries in service than any other user. Most of their batteries are on constant-voltage trickle charge continuously. They use two main types of batteries, low specific gravity and high:

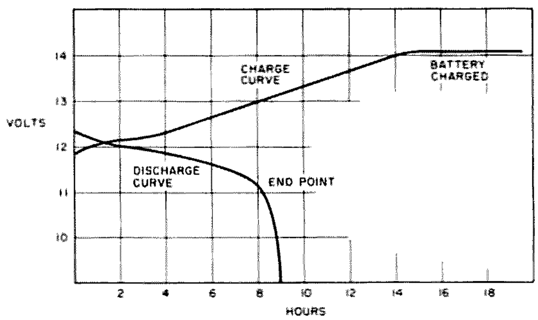


Fig. 1. Charge/discharge graph.

● Low SG type: floated at 2.17 + or − .01 volts per cell, which would be 13.02 volts for a 12-volt battery.

● High SG type: floated at 2.25 + or − .01 volts per cell, which would be 13.5 volts for 12 volts.

Batteries used in this way will last 10 to 20 years when properly maintained. Unfortunately, we cannot accept this experience as absolute because telephone batteries are commercial or industrial grade and use different alloys than are used in car batteries.

3. Ampere-hour capacity. We can be specific on this one. A 100-Ampere-hour battery will seldom, if ever, deliver 10 Amperes for 10 hours. First of all, battery output will depend on rate of discharge.

A 100-Ampere-hour battery might provide 1 Ampere for 120 hours or 25 Amperes for 2 hours. A further factor is battery age, and how it has been treated. If a car battery is discharged below 11 volts even once, its capacity will be greatly reduced. A loss of 10 to 25 percent would not be surprising.

A car battery is engineered for short, very heavy discharge followed by immediate heavy recharge. Used in this way, a good battery will last 5 years or more. In light-drain, light-recharge conditions, the battery will show serious loss of capacity in one year.

Most batteries these days are not rated in Ampere-hour capacity. Instead, they are rated in direct time and current. For example, one Gould battery was rated as follows:

Amps	Hours
2.5	41.
5.0	19.
10	8.5
15	5.3
20	3.8
25	3.0

4. Terminal Voltage: Whether this statement is true or not depends on the qualifications. If you mean open-circuit voltage, then the value of the voltage reading is doubtful. We can tell quite a bit from battery terminal voltage if the battery is placed under either charge or discharge conditions during measurement. (See graph of charge/discharge; this is the action of a car battery at about its half-life point.)

On discharge, voltage quickly drops to about 12 volts, then remains fairly constant until it reaches about 11 volts. Then it drops off quite rapidly. This is known as the "end point." Assuming that the equipment connected to the battery will still function at 11 volts, I would recommend 11 volts as the end point. Some authorities recommend 10.8 volts. Get the battery back on charge as soon as possible after reaching end-point voltage. An accurate voltmeter is essential.

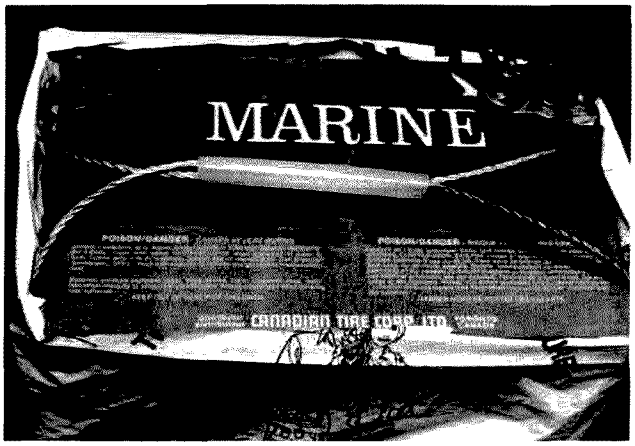
Now look at the charge curve. Notice that terminal voltage rises quite rapidly at first, then levels off, and thereafter it rises quite linearly. When it reaches the flat portion of the curve, the battery is charged.

The shape of the charge curve will vary depending on the current and voltage outputs of the charger as the battery charge condition changes. Not all battery chargers are the same.

For instance, a few years ago Heathkit put out two battery chargers. One was rated at 15 Amperes and had an automatic shutoff at 14.5 volts. Its charge rate was 15 Amperes tapering to 2 Amperes.

The second charger was rated at 10 Amperes and its charge rate decline to "the leakage rate of the battery" on output voltage of 13.2 to 13.6 volts. Note that this procedure is similar to telephone company practice. (See answer to question 2.)

If you are using an ordinary charger such as the 15-Ampere model above, then we can assume that if charge current is around 2 Amperes and voltage is about 14.5 and fairly constant, then the battery is charged.



A marine battery encased in plastic.

5. Concrete floors. This one is weird, and yet appears in several books and magazine articles. Ask the question: How could the concrete floor get through the acid-impervious case? My answer—it can't. Even if concrete were a conductor, there would have to be a leak from both terminals to the concrete to provide a path. And if there is battery leakage, why wouldn't it short directly across the top of the battery?

My explanation for this one is to consider the *occasion* for which the battery is on the concrete floor. Most likely the battery is out of service. Therefore deterioration is due to idleness, not the material it rests on.

Before we leave this one, answer this for me. Battery acid is a conductor. An acid path across the top of the battery will cause current leakage. Agreed? Then how come the acid inside the case does not cause current leakage?

6. Initial voltage is the voltage at the battery terminals immediately after the load is applied. Open-circuit voltage—see answer 4.

7. Adding battery acid. All sources agree that adding battery acid will not improve battery performance. Our experiments agree with this. However, if you are buying a new battery, it's a good idea to insist on similar specific gravity in each cell. Adding acid is sometimes done locally and is subject to error. The best advice re battery acid is: Leave it alone.

8. Marine batteries. I have talked to two different companies about this. Here is the answer I was given:

A marine battery has the same construction as a car battery with these exceptions:

● An automobile battery used in a boat is guaranteed for 6 months. In a car, it may be 42 months. A marine battery is guaranteed for 12 months.

● A marine battery has a polypropylene handle to assist in lifting it out.

● A marine battery will have screw-type terminal lugs.

● A marine battery will have a picture of a boat on it.

More recently, a new type of battery has become available. These are deep cycle (or Recreational Vehicle) batteries, designed for light-discharge, periodic-recharge service. Their internal construction is quite different. If they are as good as claimed,

they are well worth the premium price.

9. Paralleling batteries. One recommendation re paralleling storage batteries: DON'T! The weaker one inevitably will discharge the stronger. If you do want the added capacity of a second battery, use a battery isolator. These are obtainable from marine and trailer supply stores. Basically, it consists of two diodes arranged so that both batteries are charged from one source. The load is split in two and each part is separately fed from its own battery.

10. Battery terminal corrosion. Usually noticed as green grass growing on the battery cables. The idea of the oil-impregnated felt washers is a good one. Unfortunately, battery acid is creepy stuff. Once it gets out of the battery case, it's almost impossible to stop it from reaching the battery holder and, worse yet, the copper cables. The classic cure is to keep the top of the battery clean, thus preventing the acid from doing any harm. Some other steps you can take are:

- Encase the battery in a plastic bag, leaving the top open. This will contain the acid if it leaks down the sides.
- In a car, it is a good idea to pull the battery out about once a year and examine the battery holder. Any white deposits should be neutralized with diluted household ammonia. Rinse well with plain water. Put on a coat of car undercoating to help prevent recurrence. Neutralize the battery cable ends as well. Grease them lightly before reconnecting.

So that is it. Batteries: our best friends most of the time; dangerous enemies if mistreated. A few precautions and a little tender loving care and your battery is a friend for life.■

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½" x 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye." and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

Wanted: instruction sheets/manual or crystalling instructions for an E. F. Johnson Co. hi-lo band scanner, model 241-0390, 30-50 MHz and 150-174 MHz.

Mick McDaniel W6FGE
90 Temple St.
San Diego CA 92106

Can anybody help me get a schematic diagram for a Sonar Radio Corp. Model BR-2906 mobile linear amplifier? I will pay for copying and postage.

Bruce Brockway
257 S. Royal Poinciana Blvd. 106
Miami Springs FL 33166

I need the schematic or manual for a Madison Labs (Div. of Hallicrafters) FRR-71 receiver.

G. K. Barber
PO Box 31654
Aurora CO 80041

Does anyone know what improvements and updates are made by Drake when a TR7 is returned to the factory? Any information concerning mods or changes to the TR7 or TR7A would be appreciated. Are there any TR7 clubs or on-the-air nets?

Marvin Moss W4UXJ
Box 28601
Atlanta GA 30358

I am looking for a supplier of or a circuit suitable for a linear amplifier of about 10 Watts output for the 2300-MHz band that would work for A5 ATV.

Henry R. Anderson VE6LK
2226-18 Avenue South
Lethbridge, Alberta
Canada T1K 1C8

I have been running into trouble with spikes from the 110-V-ac power line and/or my outside antenna. I am looking for information concerning protectors for 2m FM.

Robert H. Saviers WA3YCA
2101 Stackhouse Dr.
Yardley PA 19067

Help! I have a home-brew RTTY and CW TU. I have connected it to my computer's serial port but have no software to run it. Having limited funds, I cannot afford commercial software. Does anyone have an Apple-/Franklin-compatible program that he would be willing to give me a copy of? I'd be more than happy to pay for it or send a disk and pay shipping costs.

Alan Jovanovich KA7DAT
So. 1165 Grand
#86
Pullman WA 99163

I am interested in obtaining the VOX relay that plugs into the back of the Swan 700 transceiver. I would appreciate hearing from someone who may have one of these lying around that they don't have any future use for.

Augustus B. Wells
PO Box 50
Tunica LA 70782

I am looking for a copy of the instruction booklet for the Knight KG670 R/C tester made by Allied Radio. I will pay the costs for copying and mailing or for the original manual.

Lionel Roach KD5VO
3033 Teakwood
Garland TX 75042

Wanted: Collins 70E-7A PTO (permeability-tuned oscillator) for a Collins 75A1 receiver. This PTO covers 2-3 MHz and is used to tune the receiver.

Harold Smith W2GKE
26 Linden St.
Bayonne NJ 07002
(201)-436-1405

I am using the VIC-20 as a RTTY terminal with Kantronics interface and software. Can anyone help me with information on building an adapter which would let me use Atari cartridges on the VIC-20?

Robert F. Cann W4GBB
1606 Lochwood Dr.
Richmond VA 23233

I would appreciate receiving a copy of the schematic for an NCX-3 SSB/CW transceiver by National. I have the owner's manual already. I will gladly reimburse for costs.

Jeffry M. Blackmon W2YI
2107 Turnbull Road
Beavercreek OH 45431

I need the schematic for the Emergency Beacon Corporation model EBC-144 Jr. two-meter transceiver; and does anybody know where the company is located?

Bruce Stevenson WA6DUE
PO Box 7
Tecopa CA 92389

I need technical information on converting a Midland 13-863 CB to ten meters. Also, can anyone tell me the frequencies of any amateur astronomy nets I could check into?

Michael J. O'Neil KA2FIR
43 Spring Garden St.
Valley Stream NY 11580

I need a schematic and/or parts layout for a Bearcat Model BC-210. I will copy and return.

Frans F. Pauli WB6VYV
3526 North Cascade, B2
Colorado Springs CO 80907

I am looking for any information or schematics for a variable power supply (0-to-60-volt, 0-to-9-Amp), model number CH 60-9, serial number 15807-1, manufactured by NJE Corporation of Kenilworth, New Jersey. All efforts will be greatly appreciated; copying costs will be paid if requested.

Don Hanson N1AZH
RFD #2, Box 3678
Greene ME 04236

I need schematics and alignment procedures for the Icom IC-22A. I will pay mailing/copying charges.

Michael S. Greene KC7FN/VE7FSJ
Code 80412 NUWES
Keyport WA 98345

Help! The Kennehoochie Amateur Radio Club is badly in need of a relay for a KLM PA 30-150 amplifier (relay designation KY1). The relay is manufactured by GE (part number 3SAF1121). The coil is equal to 125 Ohms. The relay is no longer available from the equipment or parts manufacturer.

Carol Shrader WI4K
4065 Ophie Drive
Marietta GA 30066

I need a manual for a Swan 400 transceiver equipped with a Swan 420 vfo. I will copy and return your original or reimburse your copying and shipping costs.

Rod Robbins WA7IRY
22435 Bents Road
Aurora OR 97002

I need a schematic for an antique radio. It is a Sonora, using an 80, 47, 24-a, and 35 tube set. I would appreciate any info and will pay any expenses.

John Watzke K8OXI
9910 Shore Dr.
Pigeon MI 48755

Anyone have technical specs on the CV 278/GR RTTY TU—tube-type, scope, meter, size, etc?

H. S. Robb AF0W
Box 17
Bird Island MN 55310

I'm looking for a schematic for a Lavoie oscilloscope, model no. LA265A. I will pay for copying and mailing costs.

L. C. Hocutt WE4O
4257 Via Alta Dr.
Mobile AL 36609

See List of Advertisers on page 114

Thomas M. Hart AD1B
32 Westwood Terrace
Westwood MA 02026

Another Antenna Approach

This Timex/Sinclair program goes to great lengths.

In 1983, *Time* magazine selected the personal computer as the "Man of the Year." This is perfectly understandable since microcomputers are now priced low enough to allow virtually anyone to become involved in home-computer operations.

The least expensive computer on the market (as I write this) is the Sinclair-Timex 1000 which retails for less than $100. This is not a toy; it can be expanded to a 64K memory and has many of the features of much more expensive machines.

After purchasing a ZX-81, the predecessor of the Timex 1000, I began to look for ham-radio applications. The computer is now situated on one end of my operating bench and, as time goes on, I hope to use it for computerized CW and RTTY applications.

The program presented in this article is designed to compute the dimensions of

```
 10 REM "ANTCOM
P"
 20 CLS
 25 PRINT
 30 PRINT
 40 PRINT "****
*****************
*************"
 50 PRINT "
ANTENNA DIMENSIO
N PROGRAM "
 60 PRINT "****
*****************
*************"
 70 PRINT
 80 PRINT
 90 PRINT
100 PRINT "TO D
ETEMINE THE SIZE
 OF A DIPOLE"
110 PRINT "AND
VERTICAL ANTENNA
 FOR ANY"
120 PRINT "BAND
, ENTER THE CENT
ER FREQUENCY"
130 PRINT "IN M
EGAHERTZ:"
140 INPUT F
150 PRINT
160 PRINT "
";F;" MHZ "
170 LET L1=(INT
(49200/F))/100
180 LET L2=(INT
(15000/F))/100
190 LET L3=(INT
(23400/F))/100
200 LET L4=(INT
(7130/F))/100
210 LET L5=(INT
(102.5*L3))/100
220 LET L6=(INT
(102.5*L4))/100
230 LET L7=(INT
(L2*50))/100
240 LET L8=(INT
(L1*50))/100
250 FOR N=1 TO
70
260 NEXT N
270 CLS
280 PRINT
290 PRINT "****
*****************
*************"
300 PRINT "
ANTENNAS FOR ";F
;" MHZ "
310 PRINT "****
*****************
*************"
320 PRINT
340 PRINT
350 PRINT " HAL
F-WAVE DIPOLE "
360 PRINT
370 PRINT " LEN
GTH "," EACH ARM
 "
380 PRINT L1;"
 FEET ",L8;" FE
ET "
390 PRINT L2;"
 METERS ",L7;"
METERS "
395 PRINT
400 PRINT " QUA
RTER-WAVE VERTIC
AL "
410 PRINT
420 PRINT " VER
TICAL "," RADIAL
 "
430 PRINT L3;"
 FEET ",L5;" FE
ET "
440 PRINT L4;"
 METERS ",L6;"
METERS "
450 PRINT
460 PRINT
470 PRINT
480 PRINT "ENTE
R  Y  TO CONTI
NUE"
490 INPUT Y$
500 IF Y$="Y" T
HEN GOTO 20
520 PRINT "MEMO
RY USED: ";PEEK
16396+256*PEEK 1
6397-16509
530 STOP
```

Program listing.

```
**********************************
   ANTENNA DIMENSION PROGRAM
**********************************

TO DETEMINE THE SIZE OF A DIPOLE
AND VERTICAL ANTENNA FOR ANY
BAND, ENTER THE CENTER FREQUENCY
IN MEGAHERTZ:

        14.25 MHZ

**********************************
    ANTENNAS FOR 14.25 MHZ
**********************************

 HALF-WAVE DIPOLE

 LENGTH             EACH ARM
 34.52 FEET         17.26 FEET
 10.52 METERS       5.26 METERS

 QUARTER-WAVE VERTICAL

 VERTICAL           RADIAL
 16.42 FEET         16.83 FEET
 5 METERS           5.12 METERS


 ENTER Y/N TO CONTINUE
```

Sample screens.

a dipole and a vertical antenna for a given frequency. The program requests the center frequency of the desired band and presents the data in feet and meters. The program is written in Sinclair Basic, but can easily be transposed to any other machine.

Before attempting to load the program, the program notes should be reviewed. Further, the illustrations show the computer monitor presentation of an actual run. With very little effort, the program can be modified to provide either more or less data. For example, the metric dimensions can be deleted or the decimal feet can be expressed as feet and inches through simple program changes.

In conclusion, we all can benefit from computerized operations in ham-radio applications. Computers are not just useful tools but are critical elements of everyday life. Everyone should develop some degree of computer literacy in order to cope with future demands. The Sinclair-Timex is an excellent introduction to computer logic and programming. I hope to see a flood of ZX-81 applications in the near future.■

```
********************************
   ANTENNAS  FOR 14.25 MHZ
********************************


HALF-WAVE DIPOLE

LENGTH           EACH ARM
34.52 FEET       17.26 FEET
10.52 METERS     5.26 METERS

QUARTER-WAVE VERTICAL

VERTICAL         RADIAL
16.42 FEET       16.83 FEET
5 METERS         5.12 METERS



ENTER Y/N TO CONTINUE
MEMORY USED: 1217
```

Sample output.

PROGRAM NOTES

1. Lines 20-160 set up the screen, provide directions, and accept the center frequency.
2. Lines 170-240 compute the variables.
3. Lines 250-260 are a timing loop. They hold the display and are only for graphic effect. They can be eliminated if desired.
4. Lines 280-470 control the output.
5. Lines 480-500 are a decision-making set. These allow input of additional frequencies.
6. The antenna calculations can be found in any ARRL handbook. They are:
   Dipole length in feet = 492/Freq. in MHz
   Dipole length in meters = 150/Freq. in MHz
   Vertical element in feet = 234/Freq. in MHz
   Vertical element in meters = 71.3/Freq. in MHz
   Radials are 2.5% longer than the vertical members
7. In order to provide results that are rounded to 2 significant decimal places, each INT function utilizes a number multiplied by 100. The result is then divided by 100 to give 2 decimal places. See lines 170-240.

✓See List of Advertisers on page 114

SOCIAL EVENTS

from page 66

STERLING IL
MAR 18

The Sterling-Rock Falls Amateur Radio Society will hold its 24th annual hamfest on Sunday, March 18, 1984, beginning at 7:30 am, at the Sterling High School Fieldhouse, 1608 4th Avenue, Sterling IL. Tickets are $2.00 in advance and $3.00 at the door. There will be commercial distributors, dealers, a large flea market, a concession stand, and lots of free parking, including space to accommodate self-contained campers overnight. Flea-market tables requiring electricity and all commercial tables are $5.00; all other tables are $3.00. Setup hours will be Saturday from 6:00 pm to 9:00 pm and Sunday morning. Talk-in on 146.25/.85 (W9MEP). For advance tickets and tables, send a check, payable to Sterling-Rock Falls Amateur Radio Society (SRFARS), to Sue Peters KA9GNR, PO Box 521, Sterling IL 61081, or call (815)-625-9262.

MAUMEE OH
MAR 18

The Toledo Mobile Radio Association, Inc., will hold its 29th annual Ham/Computer Fest and Auction on Sunday, March 18, 1984, from 8:00 am to 5:00 pm, at the Lucas County Recreation Center, Key Street, Maumee OH. Tickets are $2.50 in advance and $3.00 at the door. The auction starts at 10:00 am. Other features will include commercial exhibitors, ladies' programs, ample free parking all day and overnight, and refreshments. Flea-market tables are available and displays are limited to electronic, ham, and computer gear only. Talk-in on .52, .01/.61, .19/.79, .34/.94, .87/.27, .975/.375, and 447/442. For further information, write Elmer Clark KR8U, 5520 Edgewater Drive, Toledo OH 43611.

MAUMEE OH
MAR 18

The annual meeting of the American Signaling Society is scheduled for March 18, 1984. The meeting will begin promptly at 0100 hours UTC. Members and guests will convene in the Main Exhibit Hall of the Lucas County Recreation Center, 2901 Key Street, Maumee OH. Activities will include the election of officers, the ever-popular forum on Modern Signaling (chaired by Mr. Alan Pike), and a Century Club confab. For additional information, please send an SASE to The American Signaling Society, 4015 Windermere Road, Columbus OH 43220.

JEFFERSON WI
MAR 18

The Tri-County Amateur Radio Club will hold its annual hamfest on March 18, 1984, from 8:00 am to 3:00 pm, at the Jefferson County Fairgrounds, Jefferson WI. Tickets are $2.50 in advance and $3.00 at the door; tables are $3.00 in advance and $4.00 at the door. There will be plenty of food and free parking. Doors will open at 7:00 for sellers only. Talk-in on 146.52, 146.22/.82, and 144.89/145.49. For more information or advance tickets and tables, send an SASE to Bob Barker K9RIJ, 724 Burdick, Milton WI 53563.

CHELSEA MA
MAR 20

The 19/79 Amateur Radio Association will sponsor classes for the prospective Novice and Tech/General, beginning March 20, 1984, from 7:00 pm to 9:00 pm, at Chelsea High School, Clark Avenue, Chelsea MA. The only charge will be the cost of the material. For more information or to register, write 19/79 Amateur Radio Association, c/o Frank Masucci K1BPN, PO Box 171, Chelsea MA 02150.

MARSHALL MI
MAR 24

The Southern Michigan Amateur Radio Society and the Marshall High School Photo-Electronics Club will sponsor the 23rd annual Michigan Crossroads Hamfest on Saturday, March 24, 1984, from 8:00 am to 3:00 pm, at the Marshall High School, Marshall MI. Setups for sellers will be at 7:00 am with plenty of free parking and carry-in help. Tickets are $1.50 in advance and $2.00 at the door. Table space is 50¢ per foot (4-foot minimum) and it will be reserved until 8:00 am. There will be a snack bar and full food service. Talk-in on 146.52 and 146.07/.67. For reservations, send an SASE to SMARS, PO Box 934, Battle Creek MI 49016, or call Wes Chaney N8BDM at (616)-979-3433.

UPPER SADDLE RIVER NJ
MAR 24

The Chestnut Ridge Radio Club will sponsor the Ham Radio Flea Market on Saturday, March 24, 1984, at the Education Building, Saddle River Reformed Church, East Saddle River Road and Weiss Road, Upper Saddle River NJ. There is no admission fee. Tables are $10.00 for the first and $5.00 for each additional table; tailgating is $5.00. Food and soda will be available. For more information, call Jack Meagher W2EHD at (201)-768-8360 or Roger Soderman KW2U at (201)-666-2430.

MADISON OH
MAR 25

The Lake County Amateur Radio Association will present its fifth annual Lake County Hamfest and Computer Fest on Sunday, March 25, 1984, from 8:00 am to 4:00 pm, at Madison High School, Madison OH (just 40 miles east of Cleveland). Admission is $3.00 in advance and $3.50 at the door; table and display space is $5.00 for a 6-foot table and $6.50 for an 8-foot table. All display space is indoors and doors will open at 5:30 am for exhibitors. Plenty of free parking will be available. Talk-in on 147.81/.21. For reservations or more information, send an SASE to Lake County Hamfest Committee, PO Box 150, Mentor OH 44061, or phone (216)-953-9784.

GRAYSLAKE IL
MAR 25

The Libertyville and Mundelein Amateur Radio Society will hold LAMARSFEST 1984 on Sunday, March 25, 1984, starting at 8:00 am, at the Lake County Fairgrounds, Routes 45 and 120, Grayslake IL. Tickets are $2.00 in advance and $3.00 at the door. There are plenty of 8-foot swapfest-area tables available at $5.00 each. Commercial exhibitors should contact LAMARS for more information and reservations. Setups begin at 6:00 am. Food and free parking will be available. Talk-in on 147.63/.03 and 146.94 simplex. For advance tickets and table reservations, send an SASE to LAMARS, PO Box 751, Libertyville IL 60048.

OMRO WI
MAR 25

The Oshkosh Amateur Radio Club will sponsor the 4th annual OARC Auction on March 25, 1984, from 11:00 am to 4:00 pm, at a new, larger location (no stairs), Winro Hall, Omro WI. Auction items must have a $15 minimum value and OARC will charge a 10% commission on all sales. Setup starts at 9:00 am. Tickets are $2.00 in advance and $3.00 at the door. There will be a professional auctioneer and food, drink, and free parking will be available. Talk-in on 147.945/.345. For advance tickets, send an SASE and $2.00 per ticket to Tickets, K9WWW, 1646 Michigan, Oshkosh WI 54901. Deadline is March 11, 1984, and orders without SASEs will be held at the door at the buyer's risk.

GRAND JUNCTION CO
MAR 31

The Grand Mesa Repeater Society will hold the fifth annual Western Slope Hamfest on Saturday, March 31, 1984, from 10:00 am to 4:00 pm, at the Plumbers and Steamfitters Union Hall, 2384 Highway 6 & 50, Grand Junction CO. Admission is free and swap tables are $5.00 each. Features will include an indoor swapfest, Novice exams, an auction, a talk by Lys Carey KØPGM, Director of the ARRL Rocky Mountain Division, and a session on repeaters and remote bases with Ted Wetzel WBØPDU. There will be refreshments. Talk-in on 146.82 and 449.20. For further information or to reserve a swap table, send an SASE to Larry Brooks WBØECV, 3185 Bunting Avenue, Grand Junction CO 81504, or call (303)-434-5603.

FRAMINGHAM MA
APR 1

The Framingham ARA, Inc., will hold its annual spring flea market on Sunday, April 1, 1984, beginning at 10:00 am at the Framingham Civic League Building, 214 Concord Street (Rte. 126), downtown Framingham. Admission is $2.00 and tables are $10.00 (pre-registration required). Sellers may begin setups at 8:30 am. There will be radio equipment, computer gear, and food in-house. Talk-in on 147.75/.15 and .52. For more information, contact Jon Weiner K1VVC, 52 Overlook Drive, Framingham MA 01701, or phone (617)-877-7166.

TRENTON NJ
APR 1

The Delaware Valley Radio Association will hold its 12th annual flea market and computer show on Sunday, April 1, 1984, from 8:00 am to 4:00 pm, at the New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Road, Lawrence Township, Trenton NJ. There will be an indoor and outdoor flea-market area, commercial dealers, and refreshments. Sellers are asked to bring their own tables. Talk-in on 146.52 and 146.07/.67. For advance tickets and space reservations, please send an SASE to Walter L. Sharpe KB2ZY, 140 Susan Drive, Trenton NJ 08638.

SAN ANTONIO TX
APR 7

The San Antonio Area Radio Club will hold its first annual Swapfest and Bar-B-Q on April 7, 1984, from 7:00 am to 5:00 pm, at Comanche Park. Talk-In on 147.36 MHz. For more details, write Melvin Anderson, 8932 Saddle Trail, San Antonio TX 78255.

ROCHESTER MN
APR 7

The Rochester Amateur Radio Club and the Rochester Repeater Society will sponsor the 7th annual Rochester Area Hamfest on Saturday, April 7, 1984, beginning at 8:30 am, at John Adams Junior High School, 2535 NW 31 Street, Rochester MN. There will be a large indoor flea market for radio and electronic items, refreshments, and plenty of free parking. Talk-in on 146.22/.82 MHz. For further information, contact RARC, c/o W. C. McGurk WBØYEE, 2253 Nordic Court NW, Rochester MN 55901.

FLEMINGTON NJ
APR 7

The Cherryville Repeater Association will sponsor the annual Flemington NJ Hamfest on Saturday, April 7, 1984, from 8:00 am to 3:00 pm, at the Hunterdon County High School Field House on Route 31. General admission is $3.00. For early birds, breakfast will be available on site from 6:30 am. Talk-in on 147.375, 147.015, 146.52, 224.12, and 444.85. For additional information or table reservations, write Bill Inkrote K2NJ, RD 10, Box 294, Quakertown-Croton Road, Flemington NJ 08822, or call (201)-788-4080.

GREENCASTLE IN
APR 7

The Putnam County Amateur Radio Club will hold its second Amateur Radio and Electronics Auction on April 7, 1984, at the Putnam County Fairgrounds, US 231, north of Greencastle IN. Admission is $1.00, sales commission is 5%, and there will be a $1.00 service charge on buy-backs. Doors will open at 8:00 am and the auction will start at 10:00 am. Bring your equipment to be sold on consignment. All activities will be inside and food will be available. Talk-in on 147.93/.33. For more information or a flyer, contact John Underwood K9IIB, RFD 1, Box 10, Fillmore IN 46128.

KANSAS CITY MO
APR 7-8

The PHD Amateur Radio Association, Inc., will sponsor the 1984 Missouri State ARRL Convention on Saturday and Sunday, April 7-8, 1984, from 10:00 am to 5:30 pm (both days), at the Trade Mart Building, at the downtown Kansas City MO airport. For both days, registration is $4.00 and swap tables are $10.00, which includes one registration with each table. Commercial exhibitors may set up from 7:00 pm to 9:00 pm on Friday or 7:00 am to 10:00 am on Saturday; swappers may set up at 9:00 on Saturday. The Saturday-night banquet at the world-famous Gold Buffet is $10.50. Those desiring banquet tickets and swap tables are urged to order in advance. Other features will be a complete program of forums, commercial booths, a large flea market, a home-brew contest, Missouri-Kansas Amateur-of-the-Year and CW Contest awards, and on Sunday, a Missouri-Kansas Repeater Council meeting, as well as QCWA and YL luncheons. Unlimited free parking, including RV space (no hookups), will be available.

Talk-in on 146.34/.94. For more information and registrations, write PHD Amateur Radio Association, Inc., Liberty MO 64068-0011, or call (816)-781-7313 or 452-9321. All pre-registrations will be held at the door.

AMBOY IL
APR 8

The 19th annual Rock River ARC Hamfest will be held on Sunday, April 8, 1984, beginning at 8:00 am, at the Lee County 4-H Center, one mile east of the junction of 52 and 30. Ticket donations are $2.00 each in advance and $3.00 at the gate; 8-foot tables are $5.00 each. Camping space will be available for a nominal charge and breakfast and lunch will be served. There will be an auction of amateur-related gear. Talk-in on .37/.97 repeater. For more information or advance tickets (available until April 1, 1984) and tables, write to Shirley Webb KA9HGZ, 618 Orchard Street, Dixon IL 61021, or phone (815)-284-3811.

MADISON WI
APR 8

The Madison Area Repeater Association, Inc. (MARA), will hold its 12th annual Madison Swapfest on Sunday, April 8, 1984, at the Dane County Exposition Center Forum Building in Madison WI. Admission is $2.50 per person in advance and $3.00 at the door. Children twelve and under will be admitted free. Flea-market tables are $4.00 each in advance and $5.00 at the door. Doors will open at 5:00 am for commercial exhibitors, 8:00 am for flea-market sellers, and 9:00 am for the general public. Features will include commercial exhibitors, a flea market, an all-you-can-eat pancake breakfast, and a barbecue lunch. Plenty of parking space and nearby hotel accommodations are available. Talk-in on 146.16/.76 (WB9AER/R). For reservations (early ones are advised) or more information, write to MARA, PO Box 3403, Madison WI 53704.

MUSKEGON MI
APR 14

The Muskegon Area Amateur Radio Council will hold the ARRL Michigan State Convention and Muskegon Hamfest on April 14, 1984, at the L. C. Walker Arena, 4th at Western, Muskegon MI. Features will include Friday-evening hospitality rooms, programs covering areas of amateur radio interest, ladies' activities, and Saturday-evening convention dinner program. Setups for manufacturers and dealers will begin at 2:00 pm on April 13th. For more information, write Muskegon Area Amateur Radio Council, PO Box 691, Muskegon MI 49443.

JACKSON MS
APR 14-15

The Jackson Amateur Radio Club will host the Capital City Hamfest and 1984 ARRL Mississippi State Convention on Saturday and Sunday, April 14-15, 1984, at the Communications Workers of America Building, I-220 at Country Club Drive. Hours on Saturday are 9:00 am to 5:00 pm and on Sunday, 8:00 am to 1:30 pm. Admission is free and flea-market tables are $5.00 each. Attractions include commercial dealer exhibits, a large indoor flea market, concessions, forums, and free parking (including self-contained RVs). For special hamfest rates, contact the Holiday Inn Southwest directly. Talk-in on 146.16/.76. For further information, contact Carol Kemp NA5Y, 3581 Beaumont Drive, Pearl MS 39208, or phone (601)-939-7612.

RALEIGH NC
APR 15

The Raleigh Amateur Radio Society will hold its 12th annual hamfest and flea market (all under cover) on Sunday, April 15, 1984, beginning at 8:00 am, at the Crabtree Valley Shopping Mall, located at the intersection of US 70 west and US 1 and 64. Admission is $4.00 at the gate, with no extra charge for tailgaters. Tables will be available for rent. Features will include a CW contest, a homebrew contest, and special-interest meetings. Talk-in will be on 146.04/146.64 (W4DW) and 146.28/146.88 (K4ITL). For more information, contact Pete Thacher N4HQZ at (919)-876-4073 or Jim Bradley WA4AOO at (919)-851-2437 from 6:00 pm to 8:00 pm weekdays or on weekends, or write RARS, PO 19127, Raleigh NC 27619.

DAYTON OH
APR 27-29

The Dayton Amateur Radio Association, Inc., will sponsor the Dayton Hamvention on April 27-29, 1984, at the Hara Arena and Exhibition Center, Dayton OH. Admission, valid for all three days, is $7.50 in advance and $10.00 at the door. The Saturday evening Grand Banquet and Entertainment is $14.00 in advance and $16.00 at the door. Harry Dannals W2HD, past president of the ARRL, will be the featured speaker. Because seating is limited, early reservations are requested. There will be a giant flea market starting at noon on Friday and continuing all day Saturday and Sunday. Flea-market space is $15.00 for all three days and will be sold in advance only. Entrance for setups will be available starting Wednesday and the special flea-market telephone is (513)-223-0923. Other features will include forums, awards, and exhibits. For special motel rates and reservations, write Hamvention Housing, Box 1288, Dayton OH 45402; no telephone reservations will be accepted. Address all other inquiries to Box 44, Dayton OH 45401, or phone (513)-433-7720. Please send advance registration checks to Dayton Hamvention, Box 2205, Dayton OH 45401.

DAYTON OH
APR 27

The 15th annual B*A*S*H will be held on Friday night, April 27, 1984, at the Dayton Hamvention at the Convention Center, Main and Fifth Streets, Dayton OH. Admission is free and parking is available in the adjacent city garage. There will be sandwiches, snacks, and a COD bar, as well as live entertainment. For further information, contact the Miami Valley FM Association, PO Box 263, Dayton OH 45401.

DAYTON OH
APR 27-29

The 1984 Dayton Hamvention's International VHF/UHF Conference will be held concurrently with the Hamvention from Friday through Sunday, April 27-29, 1984, at the Hara Arena and Exhibition Center, Dayton OH. There will be technical forums by acknowledged experts; noise-figure, dynamic-range, and antenna-range measurement contests; and a hospitality suite with refreshments. Technical papers and presentations on VHF/UHF topics of interest are being solicited for consideration. Potential speakers should submit their requests immediately. For further information, contact Jim Stilt WA8ONQ, VHF/UHF Conference Moderator, 4126 Crest Manor, Hamilton OH 45011.

BRAINTREE MA
APR 29

The South Shore Amateur Radio Club of Braintree MA will celebrate its 53rd year in amateur radio by holding an indoor flea market on Sunday, April 29, 1984, rain or shine, from 11:00 am to 4:00 pm, at the Viking Club, 410 Quincy Avenue, Braintree MA. The entrance fee is $1.00 and 8-foot tables are $10.00 (which includes 1 free admission per table). Vendors will be admitted at 9:30 am and plenty of parking will be available. For advance table reservations, send a check payable to the South Shore Amateur Radio Club to Ed Doherty W1MPT, 236 Wildwood Avenue, Braintree MA 02184. A confirmation of check receipt will be sent and there will be no cancellation refunds after April 25. For more information, call Ed at (617)-843-4431, evenings.

ST. DAVID AZ
MAY 4-6

The Cochise Amateur Radio Association, Inc., will hold a hamfest (upgraded from a swapmeet) on May 4-6, 1984, in St. David AZ. There will be a flea market and all tailgaters are welcome. Tours planned to Tombstone, the Bisbee Lavender Pit, and other places of interest. Talk-in on .16/.76 and .52 simplex. For more details, contact CARA, Attention: Bob Clay KB7HB, PO Box 1855, Sierra Vista AZ 85636.

COLUMBIA MO
MAY 5-6

The Central Missouri Radio Association will hold Columbia Hamfest '84 on May 5-6, 1984, at the Hilton Inn, I-70 and Stadium Boulevard, Columbia MO. Features will include forums, a hospitality room, a Saturday-night banquet, a hard-surfaced flea market, display tables, and shuttle-bus service to parking areas and shopping centers. Talk-in on .16/.76 or 220.42/.02. For banquet tickets, reservations for hotels, flea-market spaces, or dealer tables, and more information, contact Ben Smith K0PCK, Route 1, Prairie Home MO 85068, or phone (816)-427-5319.

GREENVILLE SC
MAY 5-6

The Blue Ridge Amateur Radio Society will sponsor the Greenville SC Hamfest on Saturday and Sunday, May 5-6, 1984, at the American Legion Fairgrounds, White Horse Road, ½ mile north of I-85, Greenville SC. Admission is $3.00 in advance and $4.00 at the door. Talk-in on 146.01/.61. For advance tickets, write Mrs. Sue Chism N4ENX, Rte. 6, 203 Lanewood Drive, Greenville SC 29607. For further information, write Phil Mullins WD4KTG, Hamfest Chairman, PO Box 99, Simpsonville SC 29681.

CEDARBURG WI
MAY 5

The Ozaukee Radio Club will sponsor its 6th annual swapfest on Saturday, May 5, 1984, from 8:00 am to 1:00 pm, at the Circle B Recreation Center, Highway 60, Cedarburg WI (located 20 miles north of Milwaukee). Admission is $2.00 in advance and $3.00 at the door. Six-foot tables are $2.00 and eight-foot tables are $3.00. Food and refreshments will be available. Sellers will be admitted at 7:00 am for table setups. For tickets, tables, maps, or more information, send a business-size SASE to 1984 Ozaukee Radio Club Swapfest, PO Box 13, Port Washington WI 53074.

CENTRALIA IL
MAY 6

The Centralia Wireless Association, Inc., will hold its annual hamfest on Sunday, May 6, 1984, at the Kaskaskia College Gymnasium, 3 miles northwest of Centralia IL. Admission to the hamfest is free and there will be no charge for the flea-market and exhibit space (a limited number of tables will be issued on a first-come, first-serve basis). Doors will open at 7:00 am for flea-market and exhibit setups. Food and refreshments will be available, as well as plenty of free parking. Talk-in on 147.27/.87 and 146.52. For further information, contact Bud King WB9QEG at (618)-532-6606 or Lou Hodges W9IL at (618)-533-4724, or write to CWA, Inc., PO Box 1166, Centralia IL 62801.

PARAMUS NJ
MAY 6

The Bergen ARA will hold a Ham Swap 'n' Sell on May 6, 1984, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. There will be tailgating only and admission for sellers is $4.00 (bring your own table). Buyers will be admitted free. Talk-in on .79/.19 and .52. For more information, contact Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855.

DURHAM NC
MAY 12

The Durham FM Association will hold the Durham Hamfest on May 12, 1984, at the South Square Mall, Durham NC. Talk-in on 147.225. For more information, write Milan R. Burger, President, DFMA, 5711 Spruce Drive, Durham NC 27712.

See List of Advertisers on page 114

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

IARS/CHC INTERNATIONAL CONTEST
CW—0000 GMT March 10 to 2400 GMT March 11
SSB—0000 GMT March 17 to 2400 GMT March 18

This is a semiannual contest sponsored by the International Amateur Radio Society and Certificate Hunters Club. Work stations once per band, no repeaters or crossmode contacts allowed. Look for stations calling "CQ CHC."

EXCHANGE:

RS(T), IARS and/or CHC number, and state, province, or country.

FREQUENCIES:

CW—70 kHz from the bottom of the band.
SSB—3960, 7260, 14300, 21360, 28600.

SCORING:

Multiply QSOs times the number of countries worked, times the number of IARS/CHC members worked. Any member of both divisions counts as two multipliers!

AWARDS:

Engraved plaque to the highest overall score. Certificates to the highest score per band and top 10 runners-up.

ENTRIES:

Logs must show date and time in GMT, station worked, exchanges sent and received, QSO points claimed, and final claimed score. All entries with 100 or more QSOs must also include a check sheet. Entries must be mailed by June 1st to Ted Melinosky K1BV, 525 Foster Street, South Windsor CT 06074. Include a large SASE for a copy of the results.

VIRGINIA QSO PARTY
Starts: 1800 GMT March 10
Ends: 0200 GMT March 12

The 1984 QSO party is again sponsored by the Sterling Park Amateur Radio Club of Sterling Park, Virginia. The same station may be worked on each band, on both CW and SSB modes. Virginia stations may contact in-state stations for QSO and multiplier credit. Virginia mobile stations may be worked in each new county they operate from for new QSO and multiplier credit regardless whether or not previously worked on the same band and mode in another county. Stations on county borders count for only one QSO. QRP stations must run 5 Watts or less for their entire operating time.

EXCHANGE:

QSO number starting with 001 and QTH consisting of state, province, DX country, or Virginia county. Viriginia stations note that the reference for valid counties is the *CQ* magazine *Counties Award Record Book* which lists a total of 95 counties.

FREQUENCIES:

Phone—3930, 7230, 14285, 21375, 28575, and anywhere on 160-meter band except in DX windows.

CW—60 kHz up from the low end of each HF band and anywhere in 10- and 160-meter bands or Novice subbands.

SCORING:

Count one point per SSB QSO, two points per CW QSO. Virginia stations multiply total QSOs by the sum of states, Canadian provinces, DX countries, and Virginia counties worked. Others multiply QSOs by the number of Virginia counties worked.

AWARDS:

Engraved plaques to the top-scoring stations in the following categories: High Virginia single operator (fixed location); High Virginia CW-only station; High Virginia mobile; High out-of-state (including DX) station; High Virginia QRP station (if 5 or more QRP entries are received). Certificates awarded winners of Virginia counties, states, provinces, and DX countries.

ENTRIES:

Follow ARRL standard contest guidelines for logs. Indicate each new multiplier as worked. Include a summary sheet with your log and an SASE for a copy of the results. Indicate on summary sheet if mobile or QRP. Entries are due April 15th and should be addressed to: Virginia QSO Party, c/o Ken Harrigan KB2LT, 2 Darus Court, Sterling Park VA 22170.

WISCONSIN QSO PARTY
Starts: 1800 GMT March 11
Ends: 0100 GMT March 12

Use both CW and phone, stations may be worked once per mode on each band. Mobiles may be worked again when changing counties. No repeater QSOs!

EXCHANGE:

RS(T) and state, province, or Wisconsin county.

FREQUENCIES:

Phone—3990, 7290, 14290.
CW—3560, 7050, 14060.

SCORING:

Phone contacts count 1 QSO point while CW contacts count 2 QSO points. Wisconsin stations multiply QSO points by total number of states, provinces, and Wisconsin counties. DX countries count for QSO points but not multipliers. Non-Wisconsin stations multiply QSO points by number of Wisconsin counties (72 max.). As a bonus, Wisconsin mobiles add 500 points for each county contacted from outside your home county with a minimum of 15 QSOs per county to qualify.

AWARDS:

Awards will be presented to the highest scores in each state and province, and to the highest aggregate club score.

ENTRIES:

All entries must contain a log consisting of: time in GMT, call, RS(T), state, Wisconsin county, mode, and a score summary. Logs containing more than 100 QSOs must be accompanied by a dupe sheet. Entries must be postmarked by April 15th and sent to: Wisconsin QSO Party, c/o West Allis Radio Amateur Club, PO Box 1072, Milwaukee WI 53201.

BERMUDA AMATEUR RADIO CONTEST
Starts: 0001 GMT March 17
Ends: 2400 GMT March 18

The 26th Bermuda Amateur Radio Contest is again sponsored by the Radio Society of Bermuda. The contest is open to all licensed amateurs in Canada, USA, United Kingdom, and the Federal Republic of Germany. Of the 48-hour contest period, your total operating time cannot exceed 36 hours; off periods must be clearly logged. Each off period must not be less than three consecutive hours. All stations must be single operator only and must operate from their own private residence of property. Use all bands, 80 through 10 meters. No crossband or crossmode contacts are permitted. Additionally, no phone contacts are allowed between W and G or West Germany on 40 meters.

EXCHANGE:

All stations will send RS(T) reports and give the following: Canadians add province, UK stations add county, US stations add state, West German stations add DOK#, Bermuda stations add parish. US and Canadian stations may exchange reports with West German, UK, and Bermuda stations only. UK and West German stations may exchange reports with US, Canadian, and Bermuda stations only.

SCORING:

Each completed contact on each band counts 5 points. A phone and a CW contact with the same station on the same band will count if they are made at least 30 minutes apart. For all stations outside Bermuda the multiplier is the total number of VP9s worked on each band. For Bermuda stations the multiplier is the total number of states, provinces, counties, and DOK#s worked on each band.

AWARDS:

Printed awards to the top score in each state, province, county, and DOK area. The top score in Canada, US, UK, and West Germany shall receive a trophy to be awarded at the society's annual dinner held in October of each year. Round-trip air transportation plus accommodation will be provided to overseas winners to enable them to receive their awards. Top winners for the 1979 through 1983 contest shall be eligible for the area awards only.

ENTRIES:

Logs must show all dates and times in GMT. A separate sheet must be used for each band. All contestants to compute their own scores and check for duplicate contacts. Dupe sheets must be submitted with logs to cover each band where more than 200 contacts are logged. For every duplicate contact for which points are claimed, a penalty of three contacts will be deducted by the contest committee. An excess of claimed duplicates may mean disqualification. No penalty will be exacted against duplicates for which no points are claimed. Each page must be clearly numbered and marked with contestant's call, year, and band to which it refers. All contestants must sign a statement that they have complied with the

CALENDAR

Mar 3-4	ARRL DX Contest—Phone
Mar 10-11	IARS/CHC International Contest—CW
Mar 10-12	Virginia State QSO Party
Mar 11-12	Wisconsin QSO Party
Mar 17-18	YL-ISSB Commo System QSO Party—CW
Mar 17-18	Bermuda Contest
Mar 17-18	Spring QRP CW Activity Weekend
Mar 17-18	IARS/CHC International Contest—SSB
Mar 17-18	Kentucky QSO Party
Mar 17-18	Tennessee QSO Party
Mar 31-Apr 2	Connecticut QSO Party
Apr 21-22	QRP Amateur Radio Club April QSO Party
May 5-6	Late Spring QRP SSB Activity Weekend
Jul 13-15	A5 International SSTV-DX Contest
Aug 11-12	New Jersey QSO Party
Aug 24-27	A5 North American UHF FSTV-DX Contest
Sep 15-17	Washington State QSO Party
Sep 22-23	Late Summer QRP CW Activity Weekend
Dec 26-Jan 1	QRP Winter Sports—CW

Ham Rag

NEWSLETTER OF THE MONTH

The Rockford Amateur Radio Association's *Ham Rag* really does the job. Their December issue, for example, featured President's Log, Micro/Digital Corner, Secretary's Log, Tech Topics, Elmer Patrol (Novice class news), New Product Review, Potpourri, and Ham Mart. And this is all in a slick little package which includes photos! Congratulations to Editor Sharon Harlan WB9SFT, Circulation Manager Alice Davidson, and the whole crew.

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

rules and terms of their license. All logs must be received by the Contest Committee, Radio Society of Bermuda, Box 275, Hamilton 5, Bermuda, no later than May 31st. Overseas contestants are recommended to forward their logs via air mail. All decisions of the contest committee are final.

Bermuda parish abbreviations are as follows: SAN—Sandys, PEM—Pembroke, SOU—Southampton, HAM—Hamilton, STG—St. George, DEV—Devonshire, WAR—Warwick, SMI—Smiths, PAG—Paget.

TENNESSEE QSO PARTY
2100 GMT March 17 to 0500 GMT March 18 and 1400 to 2200 GMT March 18

This is the 14th annual QSO party sponsored by the Tennessee Council of Amateur Radio Clubs. You may work the same station on different bands, modes, or counties. Repeater contacts are not allowed. Mobiles compete against mobiles, portables against portables. Single-transmitter entries only. No county-line operations allowed for multiple contacts. Portable stations must set up per Field Day rules. No "list" operations are allowed. No CW contacts in phone bands.

EXCHANGE:

Signal report and state, province, country, or Tennessee county.

SCORING:

Score one point per phone QSO; 1.5 points per CW QSO. Combine phone and CW score as one contest, unless you wish to compete for phone-only or CW-only awards. Tennessee stations multiply QSO points by sum of number of different states (50), Tennessee counties (95), and VO and VE1-7 (7). DX stations count only for points, not as multipliers. Each portable or mobile station working outside their home Tennessee county scores 500 bonus points for each county outside of home county with a minimum of 10 QSOs. All others multiply QSO points by the number of different Tennessee counties worked (95 max.).

FREQUENCIES:

Phone—1860, 3980, 7280, 14280, 21380, 28580.

Novice—3725, 7125, 21125, 28125.

CW—1815 and approximately 50 kHz up from bottom of each band.

Note, you must log a minimum operating time of 10 minutes for each change of band or mode.

AWARDS:

Plaque to highest-scoring Tennessee fixed, mobile, and portable, plus out of state. First-place certificates to highest-scoring station in each state, Canada, DX country, Tennessee Novice/Technician, out-of-state Novice/Technician, Tennessee phone only, and Tennessee CW only. Participation certificates to every station sending in logs with at least 25 contacts.

ENTRIES:

Logs must show date/time in GMT, station worked, band, mode, exchange, and score. Submit a cross-check sheet similar to ARRL CD77 for each band and mode with 100 or more contacts. Logs must be legible to avoid disqualification. Logs must be postmarked by May 1st and sent to: Oak Ridge ARC, Attn: Mel Wardell K4PJ, Oak Ridge TN 37830. Please include a business-sized SASE with your logs for complete results, any certificates earned, or for return of logs (if desired).

KENTUCKY QSO PARTY
2100 March 17 to 0700 March 18
1400 to 2200 March 18

This is the second annual Kentucky QSO Party sponsored by the Western Kentucky DX Association. Stations may work the same station on different bands, modes, or counties. Mobiles compete against mobiles, portables against portables, and fixed against fixed. No county-line operation for the purpose of multiple contacts. Portable stations must set up per Field Day rules. Single-transmitter entries only, but single or multi-operators OK. Repeater contacts not allowed. No list operations permitted.

EXCHANGE:

RS(T) and state, province, country, or Kentucky county.

FREQUENCIES:

Phone—1840, 3985, 7285, 14285, 21385, 28585.

Novice—3725, 7125, 21125, 28125.

CW—1815 and approximately 60 kHz from bottom of each band.

Kentucky stations must operate a minimum of 10 minutes for each change of band or mode.

SCORING:

Count 2 points for each 160-meter QSO, phone or CW; 2 points per CW QSO on all other bands; 1 point per phone QSO on 80 and 40 meters; 1.5 points per phone QSO on 10, 15, and 20 meters. Combine phone and CW score as one contest.

Kentucky stations multiply QSO points by the sum of the number of states (50), Kentucky counties (120), plus VO, VE1-7, and VY1/VE8 (9). DX stations count only in point totals, not as multipliers. Non-Kentucky stations multiply QSO points by the total number of Kentucky counties worked (120 max.).

Portable and mobile Kentucky stations add to total score a bonus of 1000 points for each county operated outside of home county. A minimum of 25 contacts must be made in each county to qualify for the bonus.

AWARDS:

Plaques to the highest-scoring Kentucky fixed, Kentucky mobile, Kentucky portable, and out-of-state station. First-place certificates to highest score for each state, Novice, Canadian, DX station, all phone, all CW. Participation certificates to all stations submitting logs with at least 25 contacts.

ENTRIES:

Logs should show date/time in GMT, station worked, band, mode, exchange, and score. A sample log sheet is available if you send an SASE. Logs must be legible and neat to avoid disqualification. Submit a cross-check sheet (similar to ARRL form CD77) for each band and mode with over 50 contacts. Kentucky stations must show counties they worked from as part of their log entry. Logs must be postmarked no later than May 5th to be eligible for award consideration. Send a large (9" by 12") SASE with $.35 postage to ensure receiving complete contest results plus any awards you may win. No logs will be returned.

CONNECTICUT QSO PARTY
Starts: 2000 GMT March 31
Ends: 0200 GMT April 2

Sponsored by the Candlewood Amateur Radio Association (CARA). There is a rest period from 0500 to 1200 GMT. This contest is normally run in December and will reappear back in its regular slot, the first weekend in December.

EXCHANGE:

Send RS(T), serial QSO number, and ARRL section or Connecticut county.

SCORING:

Club station W1QI counts 5 points per band/mode. Novice QSOs count 2 points, OSCAR QSOs 3 points. Out-of-state stations multiply QSO points by the number

RESULTS

1983 WASHINGTON STATE QSO PARTY CERTIFICATE WINNERS

Callsign	OSOs	Multipliers	Total
	Alaska		
NL7D	42	19	1,653
	Arizona		
W7RIR	63	22	3,256
	Arkansas		
WB5RYB	87	20	3,080
	California		
W6NNV	35	19	1,995
AA6EE	35	18	1,782
	Colorado		
WB8ZRL	46	18	2,106
	Connecticut		
W1NG	79	24	4,488
	Florida		
W4WIJ	71	21	3,360
K4DDB	66	19	3,078
	Georgia		
KE4XW	112	29	6,786
	Idaho		
KA7PMP	23	11	759
	Illinois		
W9QWM	95	28	6,832
	Indiana		
WD8QBB	107	27	5,778
	Iowa		
K0HQE	34	16	1,616
	Kansas		
WD0CCW	39	18	2,070
	Kentucky		
WA4EBN	39	18	2,106
	Maine		
W1DLC	66	22	3,608
	Maryland		
W3HQU	72	21	4,536
W3FG	67	20	3,520
	Massachusetts		
KA1CLV	60	20	3,100
	Michigan		
KA8IIN	79	21	3,948
KS8Q	64	19	3,173
	Minnesota		
WA0QIT	20	9	432
	Missouri		
KM0A	25	14	924
	New Jersey		
KC2ME	29	11	759
	New Mexico		
W7LHO	37	15	1,350
	New York		
WA2PHA	63	20	2,620
	North Carolina		
K4JEX	59	19	2,793
	North Dakota		
KC0UM	14	8	224
	Ohio		
WB8LZR	14	9	252
	Oklahoma		
KD6YR	39	12	936
	Oregon		
WA7RQS	154	36	11,124
	Pennsylvania		
WA3HAE	113	26	7,358
	Rhode Island		
WB2NDE	98	26	6,084
	South Carolina		
KE4VP	23	9	414
	South Dakota		
WA0BZD	1	1	2
	Tennessee		
K4UVH	38	14	1,064
	Texas		
W5PWG	79	22	4,532
W5SOD	63	19	2,812
	Utah		
W7LN	26	11	759
	Virginia		
W4KMS	36	15	1,560
	West Virginia		
W8VEN	23	10	460
	Wisconsin		
WB9PYE	24	11	682
K9GTQ	23	12	552
	Canada		
	Ontario		
VE3EOF	24	14	952
	Brazil		
PY1NEZ	16	6	192
	Japan		
JA9YBA	35	14	1,106
	(oprs. JA9LNJ, JA9NFO)		
JH3DPB	32	14	896
KA2KS(KV7J)	25	11	704
	New Zealand		
ZM2RY	3	3	24
	Washington		
	Asotin County		
KN7L	275	50	38,750
	Benton County		
N7EPN	239	50	23,900
	Chelan County		
K7GAH	106	34	10,812
	Clallam County		
W7MPD	52	28	4,284
	Cowlitz County		
KJ7N	84	32	8,064
KO7W	83	30	6,990
	Ferry County		
KD7H/7	66	31	5,983
	Grant County		
W7WMO	443	59	64,192
	Grays Harbor County		
KW7R	282	50	34,050
	Island County		
N7AYF	1,048	100	209,600
	King County		
K7NWS	688	53	77,592
	(oprs. AK7S, KS7F, KS7Z, KA7COD)		
KA7DJR	637	55	70,070
KU7F	447	69	61,686
N7AOP	246	53	27,454
K7UU	167	40	15,240
	Kitsap County		
KC7GQ	218	46	20,056
W7IIT	110	34	11,220
	Kittitas County		
WA7STA	49	23	2,254
	Mason County		
W7DFO	109	33	8,778
	Okanagon County		
KD7H	230	41	25,420
	Pacific County		
K7NPS	254	44	28,204
	Pierce County		
WA7RWK	376	52	39,104
N7EPD	181	46	24,978
W7DK	147	39	14,820
	(oprs. KG7V, W5PBL, KL7UR, KA7CXU, K7QLC, N7DRT, K1DPO)		
	Skagit County		
K7EQ	167	43	19,092
	Snohomish County		
W7IEU	217	44	28,644
W7TSQ	202	46	18,584
	Whatcom County		
WB7CAO	201	42	16,884
	Whitman County		
W7YH	4	4	48

of Connecticut counties worked (8 max.). Connecticut stations multiply QSO points by the sum of ARRL sections worked. Additional DX contacts count for QSO points but only one DX multiplier overall is allowed.

FREQUENCIES:

CW—40 kHz up from the bottom of each band.

SSB—3927, 7250, 14295, 21370, 28540.

Novice—3725, 7125, 21125, 28125.

ENTRIES AND AWARDS:

Logs must show category, date/time (GMT), stations, numbers, bands, QSO points, and claimed scores. Enclose a large SASE for results. Logs must be postmarked by April 30th and sent to: CARA, c/o R. Dillon N2EFA, Box 954, Danbury CT 06810.

QRP ACTIVITY WEEKENDS

The various QRP Activity Weekends throughout the year are sponsored by the G-QRP-Club in England. They are intended to promote QRP activity on the times and frequencies suggested. Members from other QRP clubs throughout the world and all amateurs interested in QRP are invited to join in. QRP clubs are requested to publicize the activity periods in their club magazines.

The following times and frequencies will be used for the Spring QRP CW Activity Weekend on March 17-18, the Late Summer QRP CW Activity Weekend on September 22-23, and the QRP Winter Sports on CW, December 26 through January 1st:

0900-1000 GMT	14060
1000-1100	21060/28060
1100-1200	7030
1200-1300	3560
1300-1400	10106
1400-1500	3560
1500-1730	21060/28060
1730-2000	14060
2000-2100	7030/10106
2100-2200	3580
2200-2300	14060

In addition to the above events, members of the G-QRP-Club have weekly activity periods on Sundays between 1100 and 1230 and again from 1400 to 1530 on the International QRP frequencies (mentioned above) and on Wednesdays on 3560 from 2000 local time (for amateurs in the UK and Western Europe).

Full details of membership of G-QRP-Club from the Membership Secretary, Fred Garratt G4HOM, 47 Tilshed Close, Druids Heath, Birmingham, B14 5LT, England.

REVIEW

REVIEW OF A GLUE

Do you sometimes have the need for a good, strong, easy-to-use plastic glue—something a little better than model-airplane cement and more versatile than "super glue"? If so, you should give "Plast-i-Pair" a try.

"Plast-i-Pair" is a two-part "repair kit," mainly for plastics, but also excellent for bonding most anything to anything else.

"Plast-i-Pair" is just dandy for fixing up most of the non-electronic computer things that tend to break, crack, snap, and otherwise fall apart. It can be used to repair computer cases, broken key tops, cracked circuit card guides, broken switches, and joysticks. If you've ever broken an impossible-to-replace knob on a television or other piece of electronic gear, you will certainly appreciate this glue's ability to repair knobs!

In addition to the usual "glue" application of sticking broken things back together, "Plast-i-Pair" can be used to mold things...plugs and sockets, for example. (Ever break a weird computer or radio plug and have the metal parts still intact but the plastic all disintegrated?) It's just fine when you need to custom-build a special plug for some project, too. With just a little care, you can mold and repair fairly large sections of a broken cabinet. This works well, for example, in filling a gaping hole in the case of a $10 used video monitor!

The glue is easy to use. It does, however, require a couple of exotic materials...a mixing container and a mixing stick. For most small jobs, a baby-food-jar lid is just right for the mixing container. A tongue depressor (or Popsicle stick!) makes an excellent mixing device.

One component of "Plast-i-Pair" is a white powder, the other is a clear liquid. To use the material, merely dump a small amount of the white powder into the mixing container and add a few drops of the clear liquid. Stir until the components are well mixed. If the mixture looks grainy, you need a little more liquid. When you have it mixed (without grains), you're all set...unless, that is, you want the glue to be thicker. In that case, you just sit back and wait a few more seconds (maybe even a minute or so) until the mixture is the desired consistency. Then, apply it. Clamping is rarely needed...and even in the cases when clamping is necessary, it doesn't have to be done for very long.

For some plastic-to-plastic repairs, the liquid solvent can be used by itself as a glue. It works at least as well as most regular plastic-solvent-type adhesives.

Lest you think that this material is all fun and games, however, we should mention one tiny drawback that could get you to run out of the house: "Plast-i-Pair" smells absolutely terrible! Imagine a skunk's odor combined with a little alcohol and some acetone and you will have a rough idea of how this material smells. If you must use it indoors, an open window or an exhaust fan will be extremely useful!

In addition to its obvious computer and electronics applications, "Plast-i-Pair" is very handy for repairing kids' toys and eyeglass frames. My most recent use, incidentally, was in repairing a bird feeder. "Plast-i-Pair" was used to glue two leather straps to a piece of transparent plastic. And it held!

The smallest size kit of "Plast-i-Pair" consists of 90 cc of liquid and 3 ounces of powder. It's sold as "No. 175" and costs $5.50 plus shipping.

While you're waiting for the "Plast-i-Pair" to arrive, start saving up (or scrounging) baby-food-jar lids and Popsicle sticks!

For more information, contact the *Rawn Company, Inc., PO Box 9, Spooner WI 54801.* Reader Service number 477.

Dennis G. Brewer K8DIU/4
Greenville NC

B & W MODEL AC 1.8-30 CONTINUOUS-COVERAGE ANTENNA

Surely there are many of us who would like to operate on some band(s) in the 1.8-to-30-MHz region but who cannot, for some reason, erect a full-sized, high-efficiency antenna for same. To abandon the band(s) altogether is foolish and unnecessary, especially in light of some of the recent market offerings of multipurpose antenna systems which cover all seven popular HF bands without the requirement of external tuners or sprawling rural lots.

The Barker & Williamson model AC 1.8-30 is such a multipurpose antenna system. There is no question that the efficiency of such a system is relatively low when compared with well-elevated single-band resonant arrays. I do not believe the AC 1.8-30, or any other multiband nonresonant antenna system will work as well as individually-tuned half-wave dipoles installed the requisite half wave above ground; however, this is no reason to avoid these multipurpose systems, especially if you simply do not have unlimited space. Even an antenna with −20 dB gain (i.e., 20 dB loss compared with a half-wave dipole) can be used to make many enjoyable contacts. After all, 20 dB below a 40/S9 signal is still pretty strong.

The B & W model AC 1.8-30 is advertised as a "continuous-coverage antenna," offering some degree of efficient radiation from 1.8 through 30 MHz with a single feedline and no adjustments. Both because I wanted an antenna for 160 meters and to prove or disprove B & W's rather fantastic claims for this product, I ordered one from a franchised distributor and received it about a week later.

Inspection

Inspecting the AC 1.8-30, I found a completely pre-assembled antenna consisting of two bulky weatherproofed assemblies and 110' of stranded copperweld wire, a coil of about 100' of similar stranded copperweld wire to use as an optional counterpoise, and three heavy-duty antenna insulators. The quality of all component parts appears to be excellent. The antenna feedline, not supplied, connects to what B & W calls an rf transformer having an appearance and bulk similar to a heavy-duty wideband balun. At the opposite end of the antenna radiating wire is another bulky component which B & W calls a balancing network: This is similar in size and weight to the rf transformer and is a two-terminal device which connects between the radiating wire and ground. The balancing network is a potted assembly which appears very weatherproof and strong.

The instruction sheet supplied with the antenna is a simple two-sided photocopy which does not attempt to describe the theory of the antenna (see Theory section later in this review). It does state that the antenna will exhibit a maximum swr of 2:1 from 1.8 through 30 MHz (referenced to 50 Ohms), that the power rating of the product is 1.5 kW ICAS (intermittent commercial/amateur service), and that the antenna should be installed as an inverted "V" with the center twenty-five to thirty feet higher than the ends, making the overall antenna length about eighty feet end to end at the base. The instructions also recommend connecting the two ground terminals, one each on the rf transformer and the balancing network, directly to ground rods. Assuming this meant that I should install the antenna with the two ends nearly on the ground and the center elevated about thirty feet above the ends, I proceeded to install the AC 1.8-30 exactly in that manner.

Installation

My property measures 140' deep by 250' wide, slightly over three-quarters of an acre, and is probably typical of a suburban lot. While my lot is wide enough to accommodate a full-sized half-wave dipole for 160 meters, the trees are not in the right places to support a dipole at a sufficient height to make it work well. A half-wave dipole really should be installed a half wave above ground to work like an ideal dipole, and at 1.8 MHz this is over 200' high. If I lived in a redwood forest with 400' trees all around, I could probably work this out, but I don't, and I really couldn't see installing two 250' towers to support a $10 dipole. So, I decided to try a compromise (short, and less than 200' high) antenna for 160; thus, the AC 1.8-30.

To install the B & W antenna, I first ran a rope from a limb of an oak tree in my backyard to the top of a mast strapped to my chimney on the roof of my house. This made the rope about sixty feet long, with each end support about forty feet above ground. This rope was to be used to support the center of the B & W AC 1.8-30 at a height of about thirty feet. I figured, correctly, that the rope would stretch and sag a bit with the weight of the antenna hanging from it.

Next, with the help of my friend KT2B, I installed the antenna so that the dimensional center of the antenna wire is supported by the rope and the two ends of the antenna wire come down to the ground about eighty feet apart, just like the sketch in the B & W instruction sheet. At each end of the antenna, we drove a four foot ground rod into the earth, and then we stretched the antenna straight and connected the ground wire supplied at each end of the antenna assembly (this is pre-wired) to the two ground rods, making the ground wires quite short. This means the rf transformer and the balancing network are supported in midair by the radiating antenna and ground wires, only about a foot above ground at each end.

We were sure to install the antenna so that it makes a perfect inverted "V" and the entire antenna is in line; that is, viewed from directly above or below the antenna, it would look like a straight line. B & W doesn't mention if this is important

WHAT DO *YOU* THINK?

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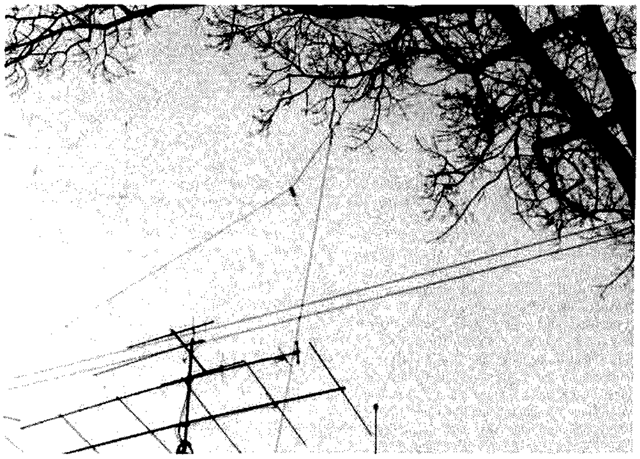

The AC 1.8-30 shown near its center, which is hanging from a horizontal support rope. The vertical rope to the right of the antenna is used for positioning the support rope.

The feedpoint rf transformer against a backdrop of New Jersey chestnut leaves. The transformer hangs between the antenna wire and a ground stake just above ground level.

but I guessed it might be, and it wasn't any extra effort to do it this way.

Measurements and Tests

We then connected a 50-Ohm feedline (at first, random lengths of RG-8/U and RG-11/U in series; later, a single length of RG-8/X), ran the cable in the house, and started making measurements. I should state that the very first band we tried out was 160 meters and I was pleasantly surprised to find that the antenna loaded well, with a measured vswr of 1.5:1 *across the whole band.* This made me kind of suspicious. The only thing I owned which was flat across any whole band was a dummy load, and I began to suspect that maybe the B & W antenna is a big dummy load. Tuning across the band, I found that the antenna is certainly no dummy, because it was receiving loud signals all across 160 meters at about 4 o'clock in the afternoon. I immediately made a few quick contacts, using my Kenwood TS-520S at about 100 Watts PEP, to determine that the contraption actually works!

Pete KT2B and I next proceeded to measure the antenna impedance using an old GE rf impedance bridge with an internal tunable oscillator; we found the impedance to be about 70 Ohms all across 160 meters and about the same all across 40 meters, but much higher on the other HF ham bands. On 80, 20, 15, and 10 meters, the impedance measured between 100 and 200 Ohms, which would have produced swr readings of 2:1 to 4:1. However, the test was premature because I had spliced together a quick feedline of RG-8/U in series with RG-11/U (75-Ohm cable), random lengths of each, and this probably had some detrimental effect on the antenna's impedance/frequency relationship.

The next day I disconnected the RG-8/U to RG-11/U system and ran an RG-8/X 50-Ohm "minifoam" coax feedline, about sixty feet long, from the antenna rf transformer to my Kenwood. Using my Bird model 43 directional coupler/wattmeter and a 100-Watt HF band element, I measured vswr vs. frequency over the six ham bands covered by my Kenwood, and this information is shown in Table 1.

The eighteen readings of Table 1 are all that are really required because it is obvious that the antenna is quite broadband and the swr within any given band doesn't change much. The "100" readings indicate immeasurably low reflected power using my most sensitive Bird element. The swr is probably never quite 1.00:1, but when I cannot detect any reflected power at all, I round the swr value to 1. When the swr is relatively high, as on 20 meters, the impedance of the antenna is higher than 50 Ohms, not lower; e.g., at 14.2 MHz, the complex impedance is about 120 Ohms.

Based on my measurements, the B & W antenna doesn't quite make the "less than 2:1 swr across 1.8-30 MHz" they claim, but it comes impressively close. Note that I did *not* install the counterpoise wire which B & W states might improve performance in some installations.

Performance

Of course, what good is a low swr if you can't get out? Not much. So I spent the entire contest weekend (November Sweepstakes) following my installation of the AC 1.8-30 antenna switching back and forth between the B & W antenna and some standards for my station: On 80 meters, I normally use a half-wave double-bazooka coaxial dipole installed as an inverted "V" with the center up sixty feet; on 40 meters, I normally use a conventional half-wave dipole at forty feet; on 20-15-10 meters, I use either a 4-element trap triband yagi (Cushcraft ATB-34, 18' boom, 8-9 dB gain/band) or a half-wave vertical (Cushcraft R-3). The triband yagi is tower-mounted at about twenty-five feet, and it should be noted that I have a hilltop location with rocky (and probably not very conductive) soil. With a total of five antennas to switch from, and I do have all the feedlines brought to a coaxial switch, I could easily compare the B & W antenna to the others listed.

Frequency, MHz	Vswr, measured
1.80	1.65:1
1.85	1.50
1.90	1.50
3.50	1.80
3.75	2.00
4.00	1.85
7.00	1.05
7.15	1.00
7.30	1.00
14.00	2.20
14.20	2.40
14.35	2.30
21.00	1.80
21.20	1.70
21.45	1.70
28.00	2.10
28.50	2.20
29.00	2.00

Table 1.

Basically, the B & W continuous-coverage antenna works fairly well. It does not compare with my beam on 14, 21, or 28 MHz, but I didn't expect that it would. It also does not compare with the R-3 half-wave vertical on those three bands. But it does hear pretty well, and it does get out. On twenty meters, I switched to the B & W antenna in the middle of a few contacts and the contacts were completed with no trouble. One of these contacts was with Hawaii, some 5500 miles distant. I guess this proves that 20 dB down from an S9 signal is still easily readable!

On forty meters, the B & W antenna really shines and performed almost as well as my half-wave monoband dipole at forty feet under most conditions. On 80 meters, the antenna works, but it is no match for my inverted "V" double bazooka, typically producing signals about three "S" units down from the bazooka standard. On 160 meters, I do not have a standard antenna with which to compare the B & W; however, I can say that the AC 1.8-30 has produced many enjoyable 160-meter QSOs at various distances from a few miles to a few thousand miles. I am running only 100 Watts PEP output on 160 and have received several complimentary reports from lots of stations who seem to "live" on that band. Clearly, the antenna works.

Theory

Intrigued by the AC 1.8-30, I made some measurements on both component parts and the completed, installed assembly to reason why or how this antenna works. The balancing network is really just a 600-Ohm dummy load (resistive termination) of rather significant proportions; I assume this is probably rated at a few hundred Watts in free air. The rf transformer is exactly that and has an impedance ratio which varies somewhat with frequency and power but averages about 12:1 (secondary:primary). I checked this by removing the transformer from the antenna circuit and performing bench tests using a Bird 43 wattmeter installed in the 50-Ohm primary side and connecting various terminating resistances across the secondary. The vswr dropped to a very low value when the transformer was terminated with 500 to 600 Ohms, yielding my estimated design ratio of about 12:1.

Based on the above findings, I surmise that the AC 1.8-30 is a "traveling-wave" antenna which need not be resonant to perform with reasonable efficiency. The antenna system looks like a terminated wire of high impedance (600 Ohms), and the rf transformer is used to match this load to its low-impedance unbalanced transmission line (50-Ohm coax). Although I didn't try it, I believe that if the antenna radiating wire were replaced with 600-Ohm open-wire transmission line hung in free space, the entire system would then become one big 600-Ohm dummy load which would hardly radiate at all; however, because in actual practice the conductor from line to load is neither shielded nor balanced, it radiates, rather

The balancing network hangs between the antenna wire and a ground stake just above the lightly snow-covered lawn.

than conducts, most of the power applied to it.

Conclusion

I guess the summary results of my tests thus far indicate that the AC 1.8-30 is ideal for anyone who only has room for or can afford just one antenna to cover all the popular HF bands. I regret I could not try it out on 30 meters, but I don't have anything on this new band (yet). On 160 meters, it is one of the few antennas which actually works and fits on a suburban lot; on the bands above 160, the B & W antenna appears to work, but not as well as single-band dedicated dipoles. For less than $150, it's not a bad deal; I'll use it just on 160 for that price and be happy about it.

For more information, contact *Barker & Williamson, 10 Canal Street, Bristol PA 19007, (215)-788-5581.* Reader Service number 476.

Steven D. Katz WB2WIK
Budd Lake NJ

FCC

47 CFR Part 97

[PR Docket No. 83-28; FCC 83-584]

Establishment of a Class of Amateur Operator License Not Requiring a Demonstration of Proficiency in the International Morse Code; Withdrawal of Proposed Rule

AGENCY: Federal Communications Commission.

ACTION: Withdrawal of proposed rules: Report and Order.

SUMMARY: This document withdraws two alternative sets of proposed rules set forth in a *Notice of Proposed Rule Making*, 48 FR 4655 (February 3, 1983). These roles would have established an amateur radio operator license class which an individual could have obtained without first demonstrating a proficiency in the international Morse code. These rules are being withdrawn because: (1) The requirement for Morse code proficiency is not a significant barrier for those who want to get an amateur operator license; and (2) it is in the public interest to maintain a skilled pool of amateur operators for the safety of life and property and public emergencies and for the national defense.

FOR FURTHER INFORMATION CONTACT: John Borkowski, Private Radio Bureau, Washington, D.C. 20554 (202) 632-4964.

Report and Order

In the matter of establishment of a class of amateur Operator License not requiring a demonstration of proficiency in the International Morse Code; PR Docket No. 83-28.

Adopted: December 14, 1983.
Released: December 23, 1983.
By the Commission.

Introduction

1. In the *Notice of Proposed Rule Making*, 48 FR 4655 (February 3, 1983) in this proceeding, we proposed to establish an amateur radio operator license which an individual could obtain without first demonstrating a proficiency in the international Morse code. The proposal was intended to attract intelligent, disciplined persons to the Amateur Radio Service who could make a valuable contribution to the service without such a proficiency. It sought to remove any barrier the code requirement might place in the path of computer-oriented or handicapped individuals otherwise qualified to be amateur operators but for the code requirement.

2. The *Notice* proposed establishment of one of two kinds of "codeless" operator license classes. One proposal was to eliminate the five word-per-minute Morse code examination element (Element 1(A)) from the existing Technician class operator licensing requirements, with all authorized amateur privileges above 50 MHz. The alternative proposal involved creation of an entirely new license class with qualifications akin to those for the Canadian Digital Amateur Class Certificate.

Background

3. The issue of a codeless amateur operator license has been addressed in past Commission proceedings. In a *Notice of Proposed Rule Making* in Docket No. 20282, 39 FR 44042 (December 20, 1974), we noted that the Morse code requirement might be a significant barrier to Amateur Radio Service (ARS) entry. In a *Notice of Inquiry* in General Docket No. 78-250, 43 FR 37729 (August 24, 1978), we considered, among other possible improvements in administering Morse code examinations to handicapped applicants, creating a new class of amateur operator license without a Morse code proficiency requirement and with eligibility restricted to handicapped applicants. In the *Third Report and Order* in Docket No. 20282, 44 FR 16460 (March 19, 1979), we stated we would like to get fresh comments on the issue and would initiate a new proceeding to do so. The *Report and Order* terminating General Docket No. 78-250, 47 FR 14197 (April 2, 1982), also discussed the possibility of a class of amateur radio operator license without telegraphy requirements.

Comments

4. Almost 5,000 comments and reply comments were received.[1] The comments were overwhelmingly opposed to the establishment of any class of amateur operator license not requiring a demonstration of proficiency in the international Morse code. There were approximately twenty comments opposed to a codeless operator class for every comment in favor of such a class.[2]

5. Comments and reply comments in favor of some form of amateur license not requiring proficiency in the international Morse code included those of the Amateur Radio Research and Development Corporation (AMRAD), the Amecom Amateur Radio Club, the Capitol Hill Amateur Radio Society (CHARS), the Centralia Wireless Association, the Emerson Electric Amateur Radio Club (Emerson), the Garden State Amateur Radio Association, the Northern Illinois DX Association, the Okaw Valley Amateur Radio Club, the Southern Michigan Amateur Radio Team, the Sterling Park Amateur Radio Club, the Tennessee Council of Amateur Radio Clubs and the Willamette Valley DX Club.

6. Comments and reply comments opposed to any form of amateur license not requiring proficiency in the international Morse code included those of the Amateur Radio Association of the Tonawandas, Amateur Radio Post 380 (American Legion, Department of California), the Amateur Radio Transmitting Society of Louisville, the American Radio Relay League, Inc. (ARRL), the Athens Amateur Radio Club, the Bay Area Two-Twenty Group, the Bell Amateur Radio Club, the Beloit Amateur Radio Club, Inc., the Bemidji Amateur Radio Club, the Black Diamond Amateur Radio Club, the Brandon Amateur Radio Society, the Buffalo Amateur Radio Repeater Association, the Butte Amateur Radio Club, the Capeway Amateur Radio Club of Massachusetts, the Central Carolina Amateur Radio Society, the Cleveland Wireless Association, the Concord Brasspounders Amateur Radio Club, the East Bay Amateur Radio Club, the Eastern Shore Amateur Radio Club, the Elmore County Amateur Radio Club, the Emporia Amateur Radio Society, the Estero Amateur Radio Club, the Everglades Chapter of the Quarter Century Wireless Association (QCWA), the Fairfield Amateur Radio Association, the Falmouth Amateur Radio Association, Inc., the Findlay Radio Club, the Flathead Valley Amateur Radio Club, the Grande Ronde Radio Amateurs, the Great Circle Shortwave Society, the Greater Milwaukee DX Association, the Greater Toledo Amateur Radio Association, the Green Fox Amateur Radio Club, the Grumman Amateur Radio Club, Hancock Emergency Amateur Radio Services, Inc., the Hendricks County Ham Club, the Hoodview Amateur Radio Club, the Houston Echo Society, the Idaho Society of Radio Amateurs (Magic Valley Chapter), the Inter-City Amateur Radio Club, the Irwin Area Amateur Radio Association, the ITT Gilfillan Amateur Radio Club, the Jackson Amateur Radio Club, Inc., the Jefferson Amateur Radio Club, the Kettle Moraine Radio Amateur Club, the Lac Qui Parle Amateur Radio Club, the Lebanon Valley Society of Amateur Radio Club, the Liverpool Amateur Repeater Club, the McHenry County Wireless Association, the McMinnville Amateur Radio Club, the Madison Amateur Radio Club, the Metropolitan Amateur Radio Club, the Metuchen Amateur Radio Club, the Mid-Oklahoma Repeator, Inc., the Mike and Key Radio Club, the Milton Academy Amateur Radio Club, the Milwaukee Radio Amateur's Club, Inc., the Milwaukee School of Engineering Amateur Radio Club, the Monongalia Wireless Association, the Murray State University Amateur Radio Club, the Nashua Area Radio Club, Inc., NBS-Brass, the North Alta Loma Repeater Club, the Northrup Radio Club, the Old Post Amateur Society, Inc., the Old Pueblo Radio Club, Inc., the Ole Virginia Ham Amateur Radio Club, the Owensboro Amateur Radio Club, the Pentagon Amateur Radio Club, the Pentucket Radio Association, Inc., Pike Amateur Radio Emergency Services, the Port City Amateur Radio Club, the Portage Amateur Radio Club, the Potomac Valley Radio Club, QCWA, the Radio Amateur Teletypists Society of Minneapolis, the Radio Club of Tacoma, Inc., the Rock River Radio Club, the St. Barnabas Amateur Radio Club, the St. Cloud Amateur Radio Club, the St. Lawrence Valley Repeater Association, the San Antonio Repeater Organization, the Santa Rosa Amateur Radio Association, the Schenectady Amateur Radio Association, Inc., the Sharon Amateur Radio Association, the Shiawassee Amateur Radio Association, the Sierra Nevada Amateur Radio Society, Inc., the Sioux Falls Amateur Radio Club, Inc., Sonoma County Radio Amateurs, Inc., the South Georgia Amateur Radio Club, the South Texas Amateur Radio Society, Inc., the South Texas Amateur Repeater Club, Inc., the South Towns Amateur Radio Society, the Southeastern DX Club, the Southern California 220 Spectrum Management Association, the Southern California Repeater and Remote Base Association (SCRRBA), the Southern Oregon Amateur Radio Club, the Steubenville-Weirton Amateur Radio Club, the Story County Amateur Radio Club, the Suburban Amateur Repeater Association, Inc., the Texas DX Society, the Texas VHF-FM Society, the Thibodaux Amateur Radio Club, the Thumb Amateur Radio Club, the University of Minnesota Amateur Radio Club, the Valley Amateur Radio Association, the Valley of the Moon Amateur Radio Club, the Viking Amateur Radio Society, the West Valley Amateur Radio Association, the Western Piedmont Amateur Radio Club, the Wood County Amateur Radio Club, the Worthington Amateur Radio Club and the York Radio Club.[3]

[1] The motion of the Capitol Hill Amateur Radio Society (CHARS) to accept its late-filed (August 1, 1983) reply comments is granted. The motion of the American Radio Relay League, Inc. (ARRL) for leave to submit supplemental reply comments on CHARS' late-filed reply comments is also granted.

[2] Many comments, such as those of Donald L. Stoner, which included "a proposal for the creation of a computer hobbyist license class," were alternative suggestions for the type of codeless license to be adopted should we decide to proceed with some sort of codeless license. We are treating these as comments on the proposal rather than as separate petitions for rule making. In view of the result reached herein, we would entertain future proposals for allocating spectrum separate and apart from amateur radio frequencies for a new computer hobbyist radio service.

Summary of Decision

7. For the reasons set forth in the discussion below, we have determined that it would not be in the public interest, convenience or necessity for the Commission to establish a class of amateur operator license not requiring a demonstration of proficiency in the international Morse code.[4] We reach this determination on the basis that: (1) A five word-per-minute (wpm) code requirement does not constitute a significant ARS entry barrier; (2) knowledge of the Morse code continues to be relevant to everyday usage in the ARS; and (3) a Morse code requirement for every license class is important to maintaining the traditional public service role of the ARS in emergencies involving public safety and the national defense.

Discussion

I. Morse code as an entry barrier.

A. *The general public.* 8. We received many comments from persons who indicated that the Morse code was a barrier for them in joining the ARS. For instance:

> I am not a licensed amateur radio operator. I have a technicians degree from the Cleveland Institute of Electronics and a Batchelor of Science degree in Electrical Engineering from the University of Tennessee. I know that I can pass the technical exams for amateur licensing. At this time the Morse code is the major obstacle between me and my amateur license. Comments of John D. Triplett.

Some commenters alleged personal learning barriers. Others indicated that they cannot find the time to learn the code.

9. To the extent a "code barrier" exists, it appears to be an attitudinal one. M. Hoshiko, faculty advisor and trustee of the Southern Illinois University Amateur Radio Club, said that very few electronics students are willing to study the code to become hams. The unwillingness to study Morse code may reflect a perception that it is an outmoded form of communication. Edward Novak commented that most individuals who will not study the code

[3] Donald B. Nowakoski's Petition to Cancel or, in the alternative, Amend is denied as an invalid petition under § 1.773 of the Commission's Rules (this is not a petition for suspension or rejection of a new tariff filing). However, this petition will be treated as a comment in opposition to the proposed rule making.

[4] As a result of this determination, we do not reach the question of which type of "codeless" license would be most appropriate.

are refusing to submit to what they perceive as an obsolete "ritual" requirement that they feel will have no application for them beyond gaining them their ham licenses. (See paragraphs 24–28, *infra*.)

10. Sometimes, a lack of willingness to study Morse code appears to be related to fear of its difficulty. One Morse code instructor stated that he has ". . . observed an initial apprehension of learing the international Morse code which usually accompanies the thought of learning something like an abstract foreign language." Comments of Gary L. Crown.

11. Those who do study Morse code appear to have few problems with the five wpm requirement. Instructors of code and theory commenting in this proceeding agreed that anyone can, with study, establish Morse code 5 wpm proficiency. Several instructors told us that no successful electronics students in their classes who really wanted an amateur license had failed to learn and pass the code test.

12. Significantly, instructors of code and theory also agreed that younger students have little or no difficulty in mastering Morse code. John B. Mollan stated that younger students have difficulty with the "theory" rather than the code requirements. John C. Hallyburton, Sr. indicated that he has experienced no difficulty in training both Cub and Boy Scouts in Morse code. And Francis J. D'Auria said that his average student learns the code with fifteen hours of study and practice, and some youngsters learn the code in eight to ten hours.[5] Melvin C. Vye, an associate professor of electronic technology at the University of Akron, indicated that young people with an interest in computers—one of the groups targeted as a basis for the *Notice* in this proceeding—have the least problem of any group in mastering Morse code.

13. Many commenters hastened to point out that a Morse code requirement cannot be much of a barrier to ARS entry, because ". . . [s]everal hundred thousand licensed Amateurs have learned Morse code and successfully passed code examinations in order to achieve a license." Comments of Richard A. Stiern. Martin D. Shapiro correctly pointed out in his comments that over the past 50 years the number of licensed amateur operators has increased from 30,000 to in excess of 400,000, or roughly 1300%.

14. In disputing the *Notice's* reliance upon a 1971 study referred to in Docket No. 20282, the Pentucket Radio Association, Inc. stated that from 1976 to 1980 the number of ARS licensees grew by 35%, adding over 100,000 persons to the Service. The Radio Operators Association of New Bedford pointed to the growth in numbers of Licensed Amateurs between 1973 and 1980 of nearly 200% Novice, 27% Technician, 30% General, 38% Advanced and 100% Amateur Extra Class licensees as evidence that Morse code requirements are not deterring ARS expansion.

15. The most recent Commission statistics showed continued increase in the number of amateur operators in fiscal year (FY) 1983. In FY 1983, the total number of amateur operators grew to 410,767 for a net gain of 4,339 operators (20,940 new operators balanced against a loss of 16,601 operators). We conclude that the Amateur Radio Service is a healthy, growing service which has attracted large numbers of new licensees over the past decade. its growth is continuing. The Morse code requirement does not appear to have critically affected the entry of new licensees into the Amateur Radio Service.

16. We conclude that a five wpm requirement for proficiency in the international Morse code is not an unreasonable burden upon license applicants. Members of the general public, particularly younger students with developing interests in electronic technology, radio and computers, are capable of learning the international Morse code at a proficiency of five wpm without undue difficulty. We conclude that to the extent a Morse code requirement acts as a bar to ARS entry for some, it is a necessary trade-off for the present nature of the Amateur Radio Service.

B. *Computer interests and the ARS.* 17. Bash Educational Services, Inc. (Bash) expressed the view that the implementation of a codeless Technician Class license would not greatly increase the ranks of amateur radio operators but would enhance the Service with the input from the more technically oriented youth in the United States. On the other hand, the Emerson Electric Amateur Radio Club (Emerson) acknowledged the affinity between home or personal (hobby) computing and amateur radio, as evidenced by packet radio, AMTOR, microprocessor RTTY, keyboard keyers, and code readers. But Emerson stated that the development of a body of pseudo-communicators who are little more than "appliance operators" would not be a sigificant step in merging the two interests.

18. Some commenters, such as William M. Pasternak (Pasternak), executive producer of Westlink Radio News, felt that while amateur radio and computer interests may overlap, most young computer users have no interest in amateur radio. Instead they pursue information retrieval and exchange through the use of modems interconnected with the public switched telephone network to access commercial computer networking organizations such as "The Source" and "Compunet."

19. After reviewing the comments, we conclude, as the ARRL stated, that:

> there is no evidence that younger, school-aged individuals whose primary interest is in computer technology will be attracted to amateur radio through the medium of such a license . . . . an interest in computer operation by no means connotes an interest in radio communications.

C. *Handicapped applicants.* 20. The vast majority of comments opposed implementation of a codeless license on the basis of a need to accommodate handicapped applicants. The only comments favoring any sort of special codeless license for the handicapped were the comments of some who, while generally opposed to a codeless license, acknowledged that they did not want to bar entry to the ARS on the basis of a person's handicap.

21. Comments from handicapped people themselves and from people who assist them in learning code and theory in order to successfully complete amateur operator examinations strongly opposed a codeless license for the handicapped. The Pentucket Radio Association, Inc. pointed out that in responding to PR Docket No. 78-250, handicapped Amateurs were not asking for a special license or elimination of requirements but instead sought acknowledgement of an individual's handicap and permission to use special techniques so that they may take the same examination as everyone else. Reo DePew expressed the view of a majority of handicapped amateurs when he stated that a "no-code" license would be unfair to them and rob them of some of their pride of accomplishment.

22. Perhaps the most telling and persuasive comments of all on this subject are those of the Courage HANDI-HAM System, an international non-profit service organization which provides amateur radio educational services, equipment and fraternity to people with physical, sight, speech and/or hearing handicaps. They stated:

> We must strenuously object to the argument that people with physical handicaps are prevented from being able to successfully complete a Morse code examination. Extensive experience in training over 5,000 severely handicapped people proves otherwise. In only six cases over the past 16 years have we encountered a situation where a *physical* (as opposed to mentel) disability has absolutely prevented an individual from learning the code at the prescribed speeds! The Courage HANDI-HAM System has developed learning methods and transcription techniques which bring the International Morse code well within the abilities of severely handicaped persons.
>
> Of perhaps even greater significance is the reason WHY so many severely handicapped Radio Amateurs put forth tremendous effort to learn the code at speeds which permit fast and reliable on-the-air communications: for many, the Morse code is the ONLY means of communications available to them. You must realize that the very person who is so severely handicapped that he has a great deal of difficulty transcribing the code is precisely the person who, by reason of severe speech involvement with his physical handicap, NEEDS the code to communicate. Comments of the Courage HANDI-HAN System.

23. We conclude that physical disability, in other than extremely rare and exceptional circumstances, does not prevent handicapped persons from learning the Morse code and successfully completing Morse code examinations. We have made every effort to accommodate the handicapped in commission—administered amateur operator examinations. We have promulgated rules to assure that the handicapped will be similarly accommodated under the new amateur volunteer examiner program. *See e.g.* 47 CFR 97.28(g). Generally, the handicapped go to extraordinary lengths and are extremely resourceful in designing methods to achieve code proficiency. Handicapped applicants are justifiably proud when they master the Morse code. They wish to be treated as co-equals in the Amateur Radio Service; not as a special group needing a special license. Thus, considerations for handicapped applicants do not appear to warrant creation of a codeless license.

II. Relevance of Morse Code

24. Comments supporting the proposals in the *Notice* claimed that knowledge of the international Morse code is irrelevant in today's ARS. In its Reply Comments, CHARS stated that it is not even necessary to have any Morse code skills to utilize the code because inexpensive home computers interconnected with radio transmitters and receivers are generally capable of transmitting and receiving Morse code at speeds between 1 and 99 words per minute. Harold A. Wilson commented that with current technology almost all communication above 50 MHz on the amateur bands is FM. David A. Miller stated that at the Technician level "99% of UHF and VHF communication is voice communication."

25. The comments on this subject are conflicting, with a large preponderance of comments of the opposite view. Alfred G. Conte, Jr., stated that the proposal for a codeless license equates with a proposal to do away with the instruction of arithmetic in elementary schools due to the prevalence of inexpensive pocket calculators. Many commenters, like Charles E. Daum, pointed to the survey conducted by Florida State University's Institute for Social Research, cited in the *Notice*, in which 83% of the amateur operators responding said that a Morse code requirement is either essential or important for operator privileges below 30 MHz, and 94% said that such a requirement is essential or important for operator privileges above 30 MHz.

26. Emil Pacock commented that Morse code has many applications today above 50 MHz. He said that it is used for weak-signal communications, which is an important and widely pursued art in the VHF and UHF bands. Edgar Herbert Callaway, Jr., further explained that such weak signal work included:

> the use of low-noise transistors, power amplifiers, high gain antennas, stable narrow-band receivers, etc. . . . The first amateur EME (moonboence) contact was made using Morse code. Also the first meteor-scatter contacts on 144, 220, and 432 MHz. The pioneering California-to-Hawaii 144 and 220 MHz contacts by W6NLZ and KH6UK (2540 miles, discovering truly long-hanl tropospheric ducting in the tropics) were made via Morse code. . . . Most of these contributions to the amateur radio service and the radio art in general were made by operators with ability, yes, state-of-the-art equipment, yes, but they all *required* Morse code. The contemporary equipment did not allow for the extra 3- to 10-dB of signal strength needed for another mode. There would have been no breakthroughs without Morse. Comments of Edgar Herbert Callaway, Jr.

27. There is also much evidence that Morse code is used frequently above 144 MHz. Matthew V. Ellsworth commented that it is often used in the two-meter and 440 MHz bands for communications with earth-orbiting satellites. He also stated that most automatic repeating stations identify by using a code generating device. Geoffrey H. Krauss said that even recent VHF contests reflect substantial Morse code usage. Richard A. Stiern commented that the Morse Code is still used extensively by the Armed Forces and the Merchant Marine because of its reliability under any circumstances. Joseph M. Rice stated in his comment that 99% of the present OSCAR satellite work is done using Morse code.

28. We conclude that Morse code still occupies a significant place in day-to-day amateur operation, particularly in the HF bands. The Morse code is used normally on VHF and UHF frequencies in conjunction with weak signal communications. The Morse code is relied upon heavily for experimentation and the development of new technological advances. The Morse code, rather than being irrelevant or obsolete, continues to be an integral part of amateur radio.

III. Use of Morse Code in Civil Emergencies and for National Defense

29. In extensive comments, Donald Godward set forth the basic philosophy of those commenters who believe that Morse code is no longer needed for amateur responsiveness in civil or military emergencies. He stated that the advent of all solid state SSB transceivers, VHF-FM gear, and RTTY equipment has essentially eliminated the need for CW in emergency operations. He said that modern SSB/FM/RTTY equipment is so small and light that it is highly portable and its power requirements are so compatible with modern batteries and portable power generators that there is no longer any real advantage to CW in emergency operations, even in terms of being able to "get through." The Mississippi Emergency Management Agency said that modern digital techniques are preferable to code for getting a message through. CHARS stated that most emergency communications in fact utilize voice, either sideband or FM.

30. However, most individuals and groups involved in amateur emergency communications urged retention of a code requirement for all amateur operator licenses. Many amateur operators brought our attention to specific instances of emergency communications that were possible only with the use of Morse code, such as this year's tornado and floods in Southeast Missouri, life threatening emergencies at sea handled by the Maritime Mobile Service Net, the rescue of the crew of the *Jala Morari*, and the rescue of the crew of a sinking ship in the Straits of Juan de Fuca. Al Uvietta, Communications Support Group Coordinator for the City of San Antonio, Office of Emergency Management, and

[5] Daniel and Claire Rosenbaum referred to the Department of the Army Technical Manual TM 11-59 and the Department of the Air Force Technical Order TO 31-3-16, entitled *International Morse Code (Instructions)*. According to this joint publication an average person can learn to send and receive Morse code with 15–22 hours of study. Based on sending and receiving proficiencies tested for one continuous mistake-free minute.

Hancock Emergency Amateur Radio Services, Inc., a group of about twenty-five amateur operators banded together by the need for emergency communications during tornadoes, floods and other disasters, commented that Morse code is more effective in getting through when communications are affected by weather, poor propagation and interference. Most commenters still view Morse code as the communications mode of last resort for the worst conditions. See, e.g., Comments of Ralph V. Anderson; Comments of James W. Partin.

31. Many commenters, including the Southern California Repeater and Remote Base Association (SCRRBA), were concerned that the anticipated growth of the ARS if we adopt a codeless license would adversely impact already-crowded repeater operation in large urban areas, with resultant detrimental effect upon emergency communications capability. The Story County Amateur Radio Club pointed out that a Morse code requirement for every amateur operator license assures maintenance of a pool of skilled amateur operators available to provide communications for the public in emergencies.

32. Several years ago, the U.S. military services "de-emphasized" the use of Morse code as a modern communications tool. Now there is a major push in the U.S. military services to re-train their radio operators in the proficient use of Morse code. In the Air Force, for example, all ground radio operators must be proficient at five words per minute before March 1, 1984. They have two years to reach ten words per minute and three years to reach 15 wpm. See the Comments of Gen. Kremin. Henry M. Wymbs, an Army Signal School graduate and former member of the Second Signal Service Battalion in World War II commented that amateurs having a knowledge of the international Morse code have always formed a trained cadre of communicators upon which the military has always depended.

33. A letter to the ARRL from Mr. Oscar A. Goldfarb, acting Deputy Assistant Secretary for Logistics and Communications, U.S. Air Force, stated that "[s]hould the Commission adopt the 'No-Code' proposal, we would establish a requirement for Morse code proficiency as a condition for becoming an Air Force MARS member." See the Reply Comments of the American Radio Relay League. The Central Intelligence Agency (CIA), in a full-page advertisement for Electronic Technicians, Communicators and Radio Operators published in the June 1983 issue of Signal Magazine and appended to the comments of Philip B. Petersen stated that "Morse code ability at 12 gpm [wpm] is preferred; other applicants will be tested for Morse aptitude."

34. We conclude that a proficiency in the international Morse code is still very useful for amateur responsiveness in civil and military emergencies. In such emergencies, it is the principal communications mode of last resort in the face of uncertain propagation characteristics or severe interference. Due to international language barriers, it is sometimes the only effective communications mode. It is in the public interest, convenience and necessity to maintain a pool of skilled amateur operators available to provide emergency communications for the public during disasters and for the national defense. Continuance of a requirement for proficiency in the international Morse code will contribute to continued maintenance of such a pool. Clearly, Morse code is a fundamental communications skill critical to the nature of the ARS.[6]

35. *Foreign Codeless Experience.* Many commenters, including Edward C. Simmons, stated that Canada has very few codeless class licensees because of a much more difficult examination than we proposed for either alternative U.S. codeless class license. On the other hand, a large number of commenters attributed the substantial growth of Japan's amateur radio service (from 70,000 licensees in 1965 to over 1,000,000 licenses in 1982) directly to Japan's easy-to-get codeless class license.[7] Our proposals fell somewhere between Canada's and Japan's codeless licenses. Neither country's experience appears directly applicable.

36. *Impact of a Codeless License Upon ARS Compliance.* Many comments opposing the proposal feared that a codeless amateur operator license would really be no more than another Citizens Band Radio Service, with what they perceived to be all its attendant problems. The Ozaukee Radio Club and the Inter-County Amateur Radio Club expressed concern that the amateur radio spectrum not be abused, as in Citizens Band. Pasternak commented that investigations by him and his news service reveal that such a license will initially be looked upon as an extension of Citizens Band Radio, to be mass marketed to the general public in a way similar to the way Citizens Band Radio was in the 1970's.

37. Coupled with this fear is a belief held by many commenters that rule compliance and dedication to public service in the ARS is a function of the time and effort a person must expend in obtaining a license. See, e.g., Comments of H. T. Hunt; Comments of the American Radio Relay League, Inc. The Honorable Lee H. Hamilton, U.S. House of Representatives, stated that the praiseworthy performance of ham operators during emergencies and their dedication to radio demonstrates a level of discipline which may be damaged by any relaxation of standards.

38. A contrary minority view, expressed in the comments of Frederick J. Glenn, is that the present written examination requires a sufficient demonstrated effort at learning. Corwin D. Moore expressed sentiments similar to those of Charles E. Cohn, who stated:

> Code lovers threaten us with CB-type chaos and insanity if the code requirement is dropped or loosened. The flaw in that argument can be readily seen if you note that a good many of the hams that have been disciplined for malicious interference have been Extra Class licensees, and thus have demonstrated code mastery, not just at 13 wpm, but at 20 wpm! Comments of Charles E. Cohn.

39. Nonetheless, the majority of commenters anticipated a large influx of undisciplined licensees as a result of either proposal in the *Notice*. The Pentagon Amateur Radio Club and others said that "weak signal" experimenters, such as those engaged in experimenting with extended range terrestrial modes of VHF/UHF communications and those involved in earth-moon-earth (EME) or "moonbounce" modes, and amateurs using satellites as relay platforms are justifiably concerned that a larger and potentially less well disciplined population of amateurs may not respect the up-to-now voluntarily imposed frequency management procedures necessary for these experiments to be conducted.

40. We are not persuaded that there is a relationship between the time and effort expended to successfully complete Element 1(A) (the Morse code 5 wpm examination) and the rule compliance or dedication to public service of a particular applicant. We believe it is not possible to predict reliably the behavior of prospective codeless licensees. Accordingly, we do not find this issue significant to our resolution of this proceeding.

Conclusion

41. The five word-per-minute slow speed Morse code requirement for the present entry-level Novice and Technician class licenses in the ARS does not appear to constitute a significant function barrier to potential applicants. The amateur ranks are growing by thousands of licensees every year with the code requirement in effect. To the extent the Morse code requirement poses a barrier for a few, we are willing to accept that "trade-off" in light of the very substantial benefits it produces both for licensees and the public.

42. The five word-per-minute Morse code requirement poses no unacceptable burden for handicapped applicants. Ingenious devices, alternative methods of examination administration, and the laudable dedication and perseverance of handicapped applicants in combination usually result in successfully completion of the Morse code examination. Licensees in the ARS who are handicapped are proud of their achievement in mastering Morse code, and generally do not seek special treatment.

43. There is still substantial everyday use of the Morse code in the ARS. The international Morse code is essential to many aspects of technical advance and experimentation in the ARS today. It is a fundamental communications skill critical to the nature of the ARS.

44. A requirement for proficiency in the international Morse code is necessary in order to insure maintenance of a trained pool of amateur operators for emergencies involving the safety of life or property or for the national defense. Dropping this requirement for an entry-level license would adversely affect amateur emergency communications capabilities, which would adversely affect the public.

45. It is unusual to receive the volume of comments we have received in this proceeding. Almost five thousand people and organizations responded to the *Notice*. They were mostly people licensed in the ARS who use their privileges on a regular basis. They were people who, by a margin of roughly twenty to one, expressed an overwhelming sentiment to maintain the current nature and makeup of the service. They felt that Morse code is an integral feature of the ARS. These commenters are the people who have made the ARS what it is today—a service that is a model of public responsiveness in times of emergency and distress, and a service that is a model of self-enforcement and volunteerism. The strong sentiment they expressed in this docket about the nature of such a service is a critical factor in weighing the proposals.

46. For all the above reasons, we have decided to reject each of the proposals set forth in the *Notice* and to retain the present licensing structure of the Amateur Radio Service.

Procedural Matters

47. In the *Notice of Proposed Rule Making, supra*, in this proceeding, we previously determined that Sections 603 and 604 of the Regulatory Flexibility Act of 1900 (Pub. L. 96–354) do not apply to this rule making proceeding since this proposal would only have amended the operator license class structure of the Amateur Radio Service. There would have been no significant impact on small businesses, small organizations or small governmental jurisdictions. Of course, since we are terminating this proceeding without action, there is no impact at all.

48. It is further ordered that the Petition to Cancel or, in the alternative, Amend filed by Donald B. Nowakoski is denied.

49. It is further ordered that the Motion for Leave to File Reply Comments filed by the Capitol Hill Amateur Radio Society is granted.

50. It is further ordered that the Motion for Leave to Submit Supplemental Reply Comments filed by the American Radio Relay League, Inc., is granted.

51. It is further ordered that this proceeding is terminated.

52. It is further ordered that the Secretary shall cause a copy of this *Report and Order* to be served upon the Chief Counsel for Advocacy of the Small Business Administration and that the Secretary shall also cause a copy of this *Report and Order* to be published in the Federal Register.

53. For further information on this proceeding, contact John J. Borkowski, Federal Communications Commission, Private Radio Bureau, Washington, D.C. 20554, (202) 632–4964.

Federal Communications Commission.
William J. Tricarico,
Secretary.

[6] In the Marine Radio Service we have granted an exemption from radiotelegraph requirements to large cargo vessels operating on U.S. coastwise voyages where such vessels carry an array of alternative communications equipment including a satellite ship earth station. *Report and Order*, PR Docket No. 79–336 (FCC 82–75), February 14, 1982. ARS operators, on the other hand, generally provide emergency assistance to people in situations where other methods of communication are not available.

[7] Emerson commented that 95% of the Japanese amateur operators hold Telephony class (codeless) licenses. They also commented that one-third of England's amateur operators and 40% of Germany's amateur operators hold codeless licenses.

HAM HELP

I need a schematic or any other available documentation on the JFD Model 600 B and W TV camera. I'll pay any reasonable charges.

Tom Workman K6TW
Rt. 9, Box 686
Tucson AZ 85743

Manual needed for a Solar Capacitor Analyzer Model CE 1-60. Lacking a manual, it would help to talk to someone who has operated one of these testers.

Homer Lawrence W8DIH
16 So. Garden St.
Norwalk OH 44857

I need the broadband couplers for 10 and 15 meters for the Central Electronics 200V or information on how to fabricate them.

Maj. Howard M. Mills
HHC 440 SIG BN
APO NY 09175

I am interested in books about switcher-type electronic power supplies: push-pull, PWM, and regulated. I would like to know their titles, authors, copyright dates, number of pages, and prices.

S. Hachikian
837 N. 64 St.
Philadelphia PA 19151

I would like the schematics, operation manual, and any pertinent information concerning the Lafayette Priva-Com 3C.

Calvin Smith, Jr.
PO Box 236
Wenonah NJ 08090

I am looking for a service manual or power-transformer output voltages for a Tennelec MPC-1 scanner. I would also like a service manual for a Tennelec MS-2.

Peter J. St. Arnaud
PO Box 8066
Lowell MA 01853

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MATERIALS

Send to Advertising Department, *73*, Elm Street, Peterborough NH 03458.

ON MARCH 11, 1984, the Morgan County Repeater Association Club will sponsor the Martinsville Hamfest at the Indiana Fairgrounds Pavilion Building in Indianapolis. Dealers, vendors, forums, and free paved parking. Doors open to the public at 8:00 am. Table reservations: Aileen Scales, 3142 Market Place, Bloomington IN 47401. BNB039

DEALERS IN SURPLUS TEST INSTRUMENTS, microwave equipment, and components. Wanted: Late test equipment H.P., Tek, G.R., Narda, etc.), waveguide/coax components. Immediate needs: H.P. X382A, R382A, S382C, 432A, 6522A, 415E. G.R. 874- and 900-series coax items, G.R. 1633, 1863, 1864. Request want list. Lectronics, 1423 Ferry Ave., Camden NJ 08104; (609)-541-4200. BNB050

WANTED—your unused Teletype™ repair parts. High prices paid! Send SASE or list of Teletypewriter parts and supplies. **TYPETRONICS,** Box 8873, Fort Lauderdale FL 33310; (305)-583-1340 after 9:00 pm. N4TT. BNB052

COLLINS: 325-3, 755-3B, 30L-1, more. Also Hy-Gain TH6DXX, rotator, tower. Make offer. WA7WOC, (602)-867-2378, evenings. BNB054.

APPLE add-on keyboard. Has various functions. Shortens keying and programming time. "AMKEY PRO-100." SASE for specs. Ralph Jannini KA1FAA, 16 Hanson Road, Andover MA 01810; (617)-457-8831. BNB055

COLLINS 75A-4 with two mechanical filters, original manual, $225, perfect condition. Also looking for schematic of Yaesu FT127RA, copy okay. AA6SC, 248 San Gabriel Court, Sierra Madre CA 91024. BNB056

FOR SALE! Hammarlund HQ 110A receiver, $75.00. Tempo One transceiver with power supply/speaker, $275. Motorola H23DEN VHF HT, $50. John Singler WA5BJC, 4815 Patrick Place, Liverpool NY 13088; (315)-451-5204. BNB057

S-830S with YK88C/YG455C filters and SP230 speaker, $600.00. Heathkit SB-200, $400.00. Heathkit SB-634 station monitor console, $50.00. Heathkit SB-614 monitor scope, $75.00. Yaesu FT-7, $275.00. Robot 400 with Sanyo video monitor and camera, $600.00. Radio Shack TRS-80 Model I with Macrotronics M800 RTTY program and Flesher TU170, $400.00. DenTron Super Tuner, $50.00. James F. Kraus, 1100 Westover Ln., Schaumburg IL 60193; (312)-894-6398. BNB058

CLEANUPS of your drawings or schematics. $5.00 minimum on all drawings. Call after 6:00 pm for more info. (816)-483-7823. Craig Schley, 1221 Monroe, Kansas City MO 64127. BNB059

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MOBILE IGNITION SHIELDING. Free literature. Estes Engineering, 930 Marine Drive, Port Angeles WA 98362. BNB006

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COLOR COMPUTER owners—call (212)-441-2807 for FREE color computer hardware and software catalog or write to Spectrum Projects, 93-15 86 Drive, Woodhaven NY 11421. BNB023

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ON MARCH 11, 1984, the Morgan County Repeater Association Club will sponsor the Martinsville Hamfest at the Indiana Fairgrounds Pavilion Building in Indianapolis. Dealers, vendors, forums, and free paved parking. Doors open to the public at 8:00 am. Table reservations: Aileen Scales, 3142 Market Place, Bloomington IN 47401. BNB040

PRINTERS: LA36 Decwriter II with keyboard, variable-width paper, etc., $325. CDI 1030 with keyboard, built-in modem, $125. W9QH, 11209 Hwy. U, Wausau WI 54401. BNB043

MILITARY TECHNICAL MANUALS for old and obsolete equipment. 60-page catalog, $3.00. Military Technical Manual Service, 2266 Senasac Ave., Long Beach CA 90815. BNB045

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UHF/VHF Spectrum Analyzer Kit, $54.95! Send stamped envelope for details. Science Workshop, PO Box 393, Bethpage NY 11714. BNB062

WANTED: Old keys for my telegraph and radiotelegraph key collection. Need pre-1950 bugs. All models of Vibroplex, Martin, Boulter, Abernathy, McElroy, etc. Also need Spark keys, Boston keys, large or unusual radiotelegraph keys, sideswipers, cooties, homebrew, and foreign keys. Neal McEwen K5RW, 1128 Midway, Richardson TX 75081. BNB063

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WANTED: Pre-1950 TV sets and old *TV GUIDE* magazines. W3CRH, Box 20-S, Macomb IL 61455; (309)-833-1809. BNB066

RETIRING? Consider a business of your own. Security alarm systems are easily learned. Installation in businesses and residences is easy, enjoyable, fascinating, profitable work. Information that could change, improve your future: $2.00 (redeemable). Security Electronics International, PO Box 1456-V, Grand Rapids MI 49501. BNB067

AM IS ALIVE! Monthly newsletter chronicles renewed amateur interest. Sample, $1; subscriptions, $9/year. AM Press/Exchange, Route 1 Box 261, Woodlawn TN 37191. BNB068

HELP! Cleaning garage—test eqpt., 6m and 2m FM gear, tubes, 1000s of service manuals for all makes and models of commercial FM xceivers 1975 and older. Reasonable prices. Send SASE for list. Tom McLaughlin WB4NEX, PO Box 411, Mango FL 33550, (813)-681-9709. BNB069

ICOM AT-500, cover, $280. Tempo S-15T, HM-15, case, $240. Panasonic RF-2600, $140. New Yaesu FC-700, $90. Interact Computer CW system, $40. FOB Lanny Aldrich K1LEC, Box 73, N. Springfield VT 05150; (802)-886-8121. BNB070

WANTED: Military surplus radios. We need Collins 618T, ARC-72, ARC-94, ARC-102, RT-712/ARC-105, ARC-114, ARC-115, ARC-116, RT-823/ARC-131 or FM622, RT-857/ARC-134 or Wilcox 807A, ARC-159, RT-1167 or RT-1168/ARC-164, RT-1299/ARC-186, RT-859/APX-72, APX-76, ARN-82, ARN-84, ARN-89, RT-804/APN-171, RT-829/APN-171, MRC-95, 718F-1/2, HF-105, Collins antenna couplers, 490T-1, 490T-2, 490T-9, CU-1658A/ARC, CU-1669/GRC, 490B-1, CU-1239/ARC-105, 490D-1. Top dollar paid or trade for new amateur gear. Write or phone Bill Slep, (704)-524-7519, Slep Electronics Company, Highway 441, Otto NC 28763. BNB071

WANTED: SB-201 with 10 meters, good condition, mech. and elec. Steve Pesany, 2840 Gerritsen Ave., Brooklyn NY 11229. BNB072

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RTTY FOR THE TI99/4a. Mini-memory required. Mark and space tones are computer-generated in send mode. TU is needed for receive-only. $17.95. Mark Schmidt, 4661 Lark Dr., Beale AFB CA 95903. BNB074

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NEW ANTENNA ROTATOR FOR BLIND HAMS

Telex/Hy-Gain has introduced the HAM-SP rotator designed for visually-impaired amateur-radio operators.

The control unit functions are marked in both braille and conventional lettering. The unit also emits a high-frequency tone to indicate rotator action. Since the brake release as well as delayed brake engagement is automatic, operation of the rotator is a simple one-hand, one-touch operation to aid the blind.

When mounted inside a tower, the new HAM-SP rotator is designed to operate large antenna arrays up to 15 square feet ($1.4m^2$) wind-load area. The HAM-SP (Catalog No. 307) is available at amateur-radio dealers.

For more information, contact *Telex Communications, Inc., 9600 Aldrich Ave. So., Minneapolis MN 55420, (612)-884-4051.*

FT-757GX LINE COMPUTER-AIDED TRANSCEIVER

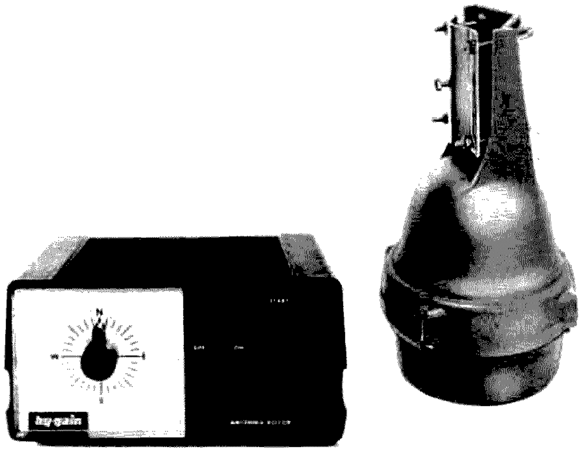
Yaesu Electronics Corporation has introduced the FT-757GX Line, the latest generation of CAT (computer-aided transceiver) technology from the engineers at Yaesu Musen Company, Ltd.

Controlled by three 8-bit microprocessors, the FT-757GX is a full QSK synthesized transceiver offering general coverage on receive and ham-band transmit capability, with expanded coverage available for MARS operators. The transmitter section is specified for up to thirty minutes of continuous operation at a nominal output of 100 Watts. For maximum operating flexibility, the FT-757GX performance package includes dual vfo's, eight memories, all-mode squelch, and a variety of scanning features. A 600-Hz CW filter, electronic keyer module, af speech processor, and FM capability are all included in the purchase price.


The Yaesu FT-757GX CAT.

Among the high-performance options for the FT-757GX Line are the FC-757AT automatic antenna tuner with band/antenna memory, the FP-757GX compact switching regulator power supply, the FP-757HD heavy-duty power supply (for continuous duty applications), the FP-700 standard power supply, and the FTV-700 transverter.

For further information on the FT-757GX Line or other Yaesu transceivers designed for computer interface, contact *Yaesu Electronics Corporation, PO Box 49, Paramount CA 90723.* Reader Service number 482.


HAM-SP antenna rotator for the visually handicapped.

EQ300 MICROPHONE EQUALIZER FROM HEIL

The new EQ300 from Heil, Ltd., is an improved version of its EQ200. The EQ300 has an output-level control on the front panel so that one model can be used to drive either mike-level inputs (Kenwood, Yaesu, etc.) or line-level inputs used with the new Icom series transceivers.

The EQ300 uses an internal mike gain trimpot for initial setting with your mike. The front-panel Output control provides a variable level up to +2.0 volts out, sufficient to drive any transceiver microphone input, including the new Icom series. Simply adjust to .10 V out (11 o'clock) for Kenwood, Yaesu, etc., and 1.5 V (3 o'clock) for Icom.

Just two models are offered, The EQ300-4 and the EQ300-8. Both use two active filters, the low centered at 490 Hz and the high at 2200 Hz, with plus or minus 18 dB of boost and cut. The only difference in the two models is the connectors. Order either 4 or 8 pins to match your rig. A two-tone generator used for tuning linear amplifiers with an oscilloscope is also available for either model.

The new EQ300 has a power adapter circuit built in so it can be operated from a 9-volt battery or from a good 12-volt dc supply, and excellent RFI suppression has been installed for use in heavy rf environments.

The EQ300, as all of the 1984 Heil products, will be housed in their new beige and chocolate enclosures. All Heil products now feature the same two-color control knobs and switches used on their famous recording studio equipment.

For more information, contact *Heil Ltd., Box 68, Marissa IL 62257, (618)-295-3000.* Reader Service number 484.

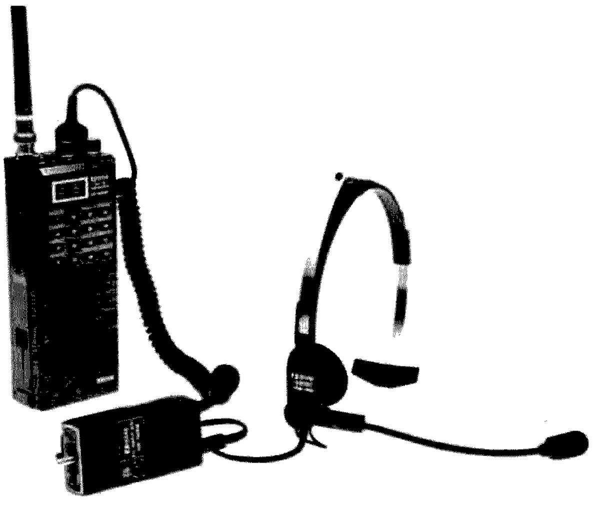
NEW PRODUCTS FROM ICOM

Icom has introduced the IC-HS10 Headset and IC-HS10SB PTT Switch Box which can be used with all Icom hand-held transceivers: the IC-2A and 2AT; IC-3A and 3AT; IC-4A and 4AT; IC-02A and 02AT; and IC-04A and 04AT. The easy-to-use system has the following features:

IC-HS10 Headset

- Crystal-clear reception
- Pivoting microphone
- Light weight
- Adjustable boom
- Folds up for safe and compact storage

EQ300 microphone equalizer from Heil.


New headset and switch box from Icom.

- Adjustable for comfortable fit

IC-HS10SB PTT Switch Box

- Compact size: 3" H x 1.5" W x .75" D
- Belt clip
- Provides transmit-receive switching control
- Mike gain control
- Molded plastic connector for speaker/mike connection to hand-held

The IC-HS10 Headset and IC-HS10SB PTT Switch Box may be purchased separately.

For more information, contact *Icom America, Inc., 2112 116th Ave. NE, Bellevue WA 98004, (206)-454-8155.*

MORSE-CODE TUTOR

Tutorcode is an instructional software release which can establish your Morse-code proficiency from 3 to 25 words per minute in an exciting, enjoyable game-type atmosphere. Tutorcode is written in machine language for any TRS-80 16K or larger Color Computer system. Extended Basic is not required. Sound flash cards are easily accessible from the menu-driven program. A string of up to 255 characters may be input from the keyboard and the equivalent Morse code will be output at any selected code speed on command.

Tutorcode is available on cassette only from *Rabbitt Ware, Inc., Rt. 1 Bascomb Road, Jackson TN 38305, (901)-668-8816.* Reader Service number 478.

ICM ALIGNMENT OSCILLATORS

International Crystal Manufacturing Company has introduced the FOT-12 and FOT-12 LOW alignment oscillators. They provide a convenient stationary or portable signal source for alignment purposes, convenient for alignment of first i-f frequencies in pagers and other receivers.

Six crystal positions permit the user to choose any one of six frequencies. The FOT-12 LOW covers the frequency range 250 kHz to 4.0 MHz, and the FOT-12 covers the range 4.0 MHz to 24.0 MHz.

Front-panel controls include a six-position switch for selecting the frequency, a BNC-type connector for rf output, and a power switch with an indicator lamp for internal or external power.

The internal battery permits operation away from the test bench. Jacks are provided on the rear panel for an external dc power source.

Following is a list of specifications.

- Rf output—1 V across 470 Ohms
- Power requirements— 9 to 15 V dc @ 0 mA maximum
- Frequency adjustment—trimmer provided at each crystal socket for adjustment to nominal frequency
- Operating temperature— −10° C to +60° C
- Stability—maximum change of ±25 ppm (−10° C to +60° C, referenced to 25° C)
- Dimensions—5" W x 2¾" H x 6" D overall

These units are available direct from the manufacturer. For more information, contact *International Crystal Manufacturing Company, Inc., PO Box 26330, Oklahoma City OK 73126, (405)-236-3741.* Reader Service number 480.

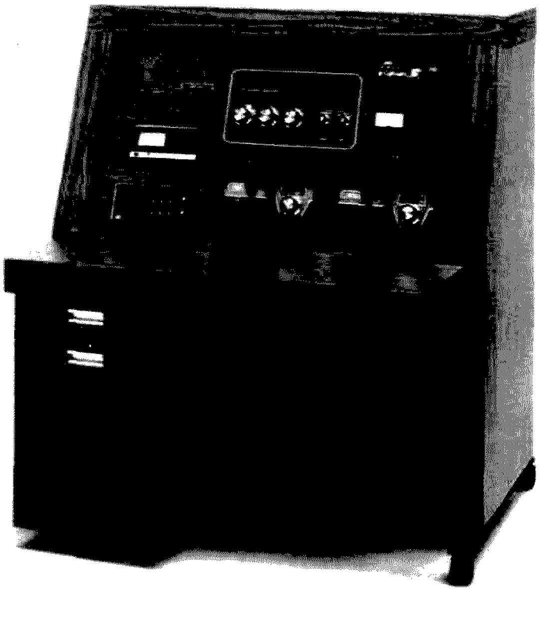
BREAK CONSOLES

Break Communications Systems has introduced 4'-, 6'-, and 8'-wide wood/mica communications consoles. The replaceable front panel is bolted in with steel clamps for easy low-cost station updates over the years. Front-panel holes are precisely cut by computerized X-Y wood-cutting table, and hole/equipment gaps are less than 1/32"!

The purchase price includes: front panel cut for your station, hidden accessory shelf for power supplies (dummy loads, etc.), pre-assembled rear equipment support system (rigging), teak mica, casters, multiple tap station ground bus, one set of puppets of your equipment, and ½-scale front-panel grids for station layout and design assistance. Corner units are available to integrate standard width consoles into "L" and "U" circular configurations.

Options include: 1000 different micas to match your decor, drawer/bookshelf combination, pencil drawer in desk's front edge, keyboard cut-out in desk top, shelf under desk, desk-top extension into the front panel, dolly for floor-standing amplifiers, temperature-controlled fan cooling system, wire duct, labels, ties, etc. Custom work makes the basic console just right for your station.

For additional information, contact Larry Kushner WA6BKC/4 at *Break Communications Systems, Inc., 5817 SW 21st Street, Hollywood FL 33023, (305)-989-2371.* Reader Service number 479.



Wood/mica communications console from Break.

SOLID-STATE DIP METER FROM CAYWOOD

A solid-state dip meter for testing radio frequencies, antennas, oscillators, rf chokes, and similar devices, formerly manufactured by Millen, is available from Caywood Electronics, Inc., of Malden, Massachusetts.

The Millen Solid-State Dipper is a portable oscillating frequency meter that determines the resonant frequency of de-energized resonant circuits with an accuracy of ±2%. Covering a range from 1.65 to 310 MHz with 7 plug-in coils, it also features an absorption-type wavemeter with the oscillating circuit acting as a Q multiplier amplifier to enhance tuning response and dip sensitivity.

Weighing only 2½ pounds, the 7¼" D x 3½" W x 3¾" H Millen Solid-State Dipper provides a calibrated 205° drum dial with 7 direct reading scales and a universal scale. The rugged copper-plated steel unit and coils store in a handy 11¾" D x 5¼" W x 4" H carrying case. An optional tube-type dipper with 5 additional coils for frequencies down to 165 kHz is also offered.

For more information, contact Wade Caywood KA1UP, *Caywood Electronics, Inc., PO Drawer U, Malden MA 02148.* Reader Service number 481.

MFJ-1423 ENHANCER/STABILIZER

Enhancement and stabilization are basic necessities for even the beginning videophile. That's just what the MFJ-1423 offers: all the controlled, detailed sharpness and picture clarity of an enhancer combined with a stabilizer to remove picture roll and override copyguard.

The enhancer allows you to control the picture by defining, clarifying, and sharpening the fine details of the picture to the desired degree. The enhancer features an exclusive new light-enhancer mode that enhances light areas only, which yields reduced snow in the dark areas of the picture. The enhancer has 2 adjustment features that let you control the picture: (1) The Enhancement control lets you decide the degree of sharpness and clarity you want, and (2) the Noise Cancel control helps eliminate snow which is sometimes brought on by increased enhancement. An Enhancer Bypass switch also gives you the added convenience of being able to make a quick, clean, definite comparison between the unenhanced and the enhanced picture just by the touch of a button.

The stabilizer removes picture roll

The FOT-12 alignment oscillator from ICM.

Caywood's solid-state dipper.

caused by copyguard. It features a Stabilizer Bypass switch, including an LED for on-off identification at a glance, and a stabilizer control knob that is non-critical to adjust. Just turn the knob until the picture locks in, then sit back and enjoy the picture.

The enhancer/stabilizer features a Power On-Off Bypass switch so you won't be bothered with reconnecting at times when the enhancer/stabilizer is not needed. The front panel has an LED Power On-Off indicator and is operated by high-quality aluminum knobs and switches to make tuning and adjusting feel as smooth as silk.

The back-panel controls include the following:

(1) a Channel 3/4 Selection Switch corresponds to channel 3 or 4 on the television.

(2) The RF Out consists of a built-in rf modulator which allows listening and viewing on any standard television. It outputs a signal that connects directly to the VHF of the television.

(3) An Audio In jack connects the audio signal from the source (VCR, video disk, camera, etc.).

(4) Two Video Out and one Video Out/Bypass jacks output the enhanced/stabilized video signal. The Video Out/Bypass allows you to bypass the MFJ-1423 when in the Off position. A built-in distribution amplifier allows three copies to be made or viewed simultaneously.

(5) The Video In is where the video signal from the source is connected.

(6) The PWR jack is where the ac adapter is connected. The MFJ-1423 operates on 110 V ac or on 112 V dc as a portable (possibly for camera use). All connections on the back panel are RCA jacks. Three cables for hook-up are included.

The unit is housed in a rugged black aluminum cabinet with an attractive brushed aluminum front and measures 7" × 2" × 6" overall.

MFJ offers a 30-day money-back trial period on all direct purchases. If you are not satisfied, return the unit and get a full refund (less shipping). MFJ also offers a one-year unconditional guarantee on all MFJ products.

For more information, contact *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762.* Reader Service number 483.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

INTERNATIONAL DX CONVENTION

The 1984 International DX Convention is coming to Visalia, California, April 13-15. Will you be there? This top-notch convention attracts DXers and DX operators from around the world and includes seminars featuring many of the DXpeditioners of the past year.

Sponsorship alternates between the Northern and Southern California DX Clubs. 1984 is a Southern Cal year. The convention location remains the same—the Holiday Inn in Visalia. Pre-registration, including the banquet and Sunday breakfast, costs $38 ($42 after March 15, 1984). Send your check to Westcoast DX Convention 1984, c/o Treasurer Nick Winter WB6DXU, 1426 North Avon St., Burbank CA 91505.

4U1VIC—THE VIENNA INTERNATIONAL AMATEUR-RADIO CLUB

When is a country not a country? When it is the Vienna International Amateur Radio Club! This station, the third one to use the United Nations 4U1 prefix, counts as a separate country for the DARC-sponsored Worked All Europe award, but not for the ARRL-run DXCC program.

The original 4U1 station was set up in Geneva, Switzerland, at the headquarters of the International Telecommunications Union (ITU). Back in the days when DXing was a gentlemanly activity, the amateur-radio club at the ITU headquarters asked for and received separate-country status, based on the fact that the station was located on United Nations property, and not in Switzerland proper. For years 4U1 meant 4U1ITU. The station has been a gathering point for numerous international visitors and the showcase amateur station for telecommunications officials attending conferences in Geneva. Amateur radio greatly benefitted from the existence of 4U1ITU.

Then, in the 1970s, some enterprising amateurs in New York City convinced United Nations authorities to permit a similar station in a UN building (on UN land; the US gave the land to the UN years ago) in downtown Manhattan. K2UN operated quietly for a while, until it dropped its bombshell: the station applied for separate-country status under the then-current DXCC rules. The ARRL's DX organization was faced with a nasty dilemma: either authorize a new "country" in the middle of downtown New York City or throw out the well respected and very useful 4U1ITU.

Since the League was facing the upcoming World Administrative Radio Conference (WARC), throwing out 4U1ITU was not even considered, and 4U1UN gained status as a separate country. This obvious absurdity, along with the approval of such nonsense "countries" as St. Paul Island and Sable Island off Nova Scotia and Desecheo off Puerto Rico, led to the League's throwing out the "separate-administration" provision for a new country.

Which brings us back to 4U1VIC. In 1979 all United Nations organizations in the Vienna, Austria, area were consolidated into a single-building complex on the banks of the Danube River. As with the United Nations complexes in Geneva and New York, the adjacent land becomes part of the UN, not Austria. The region is now known as Vienna International Centre (VIC) or UNO City.

Among the many amateur-radio operators on the staff of the various UN organizations in Vienna were Tom Gabbert K3TG/OE1ZGA and Horst Eisenlohr DL9OL/OE3OLW. They paved the way for the formation of the Vienna International Amateur Radio Club and convinced UN Headquarters to grant them the callsign 4U1VIC. The station began operation last fall.

The operators of the station include hams from many different countries, since membership in the VIARC is restricted to staff and accredited diplomatic staff. The club members loan equipment to the station and feed a triband vertical on the roof of the 350-foot-high UN building. During contest operation, the club members string temporary dipoles for the lower bands.

The combination of antenna restrictions and the time limitations of the operators makes 4U1VIC a challenge for the DXer. The best times to watch for the station are local lunchtime, early evenings, and weekends, especially during contests. The station was on the air during most of the *CQ* WW SSB test last fall. Try 1130-1300 UTC and after 1630 UTC, around 14030 or 21030 CW and 14200 or 21300 SSB.

As with other club stations, the QSL chores fall on the operator making the contacts. Your best bet for a confirmation is to include the name of the operator on the card. The QSL address is VIARC, Box 200, A-1000 Vienna, Austria. Two IRCs with your self-addressed envelope will bring a direct response with UN stamps. Or you can send the card via the well-run Austrian QSL bureau, which handles the cards as a courtesy for the VIARC.

Why is 4U1VIC considered a country at all, if DXCC rules don't permit separate-country status? The DXCC is not the only game in the DX community, although it is the most respected award program. The German national amateur-radio organization, the DARC, also sponsors a prestigious award for working all the countries of Europe, and their country list is slightly different from the League's DXCC country list. Specifically, the Shetland Islands off the Scottish coast and the island of Sicily (IT9) are "separate countries" for the DARC award program.

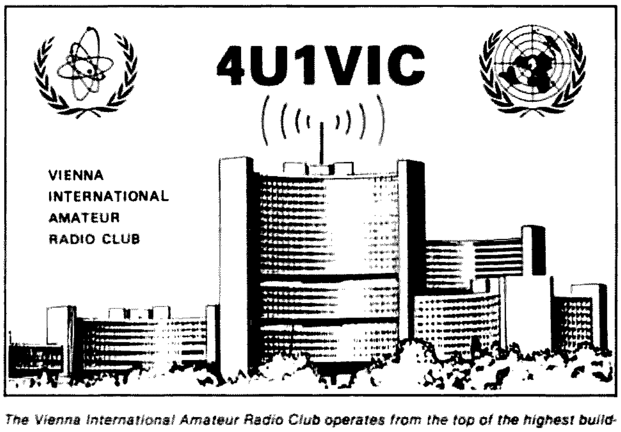
This is of interest to radio contesters, because both the DARC-sponsored Worked All Europe contest in the fall and the *CQ* WW test use the DARC country list for multipliers. This means that the Shetland Islands, Sicily, and now 4U1VIC count as separate multipliers for these contests, but not for the ARRL DX test in the spring, which uses the DXCC list.

DX FOLLOW-UP

Several members of the International DX Foundation traveled to the tiny country of St. Kitts in the Caribbean last summer to hand out DX contacts on all bands from 160 meters through 2. The four amateurs (see Photo A) hauled a Yaesu FT-901ZD, a Kenwood TS-130S, and VHF gear to the island, which is about 200 miles east of Puerto Rico. Antennas included a triband beam, a long six-meter yagi, dipoles, and a vertical (see Photo B).

The group made several thousand contacts in more than 100 different countries during the stay, including 10 countries on 6 meters! If you worked any of the four different callsigns used (VP2KBH-KBK), send your QSL card to Andy Anderson K8EFS, 4300 South Cochran, Charlotte MI 46813.

As promised (see this column, October, 1983), the Colombian amateur-radio organization mounted an impressive DXpedition to Malpelo this past fall. Thirteen



The Vienna International Amateur Radio Club operates from the top of the highest building in the United Nations complex on the Danube.

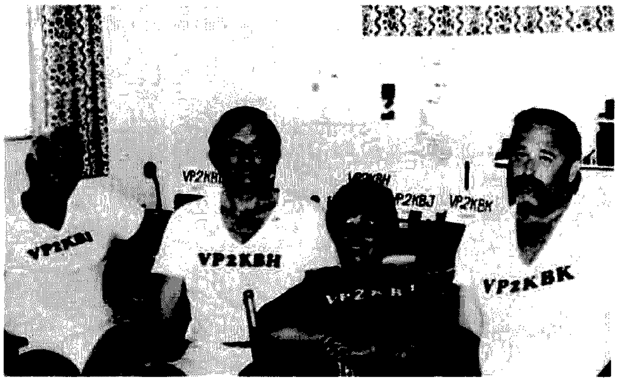


Photo A. The St. Kitts DXpedition crew relaxes in front of their operating position: (left to right) Kaye VP2KBI/N8AKY, Don VP2KBH/WB8BKC, Donna VP2KBJ/KA8LDO, and Andy VP2KBK/K8EFS.

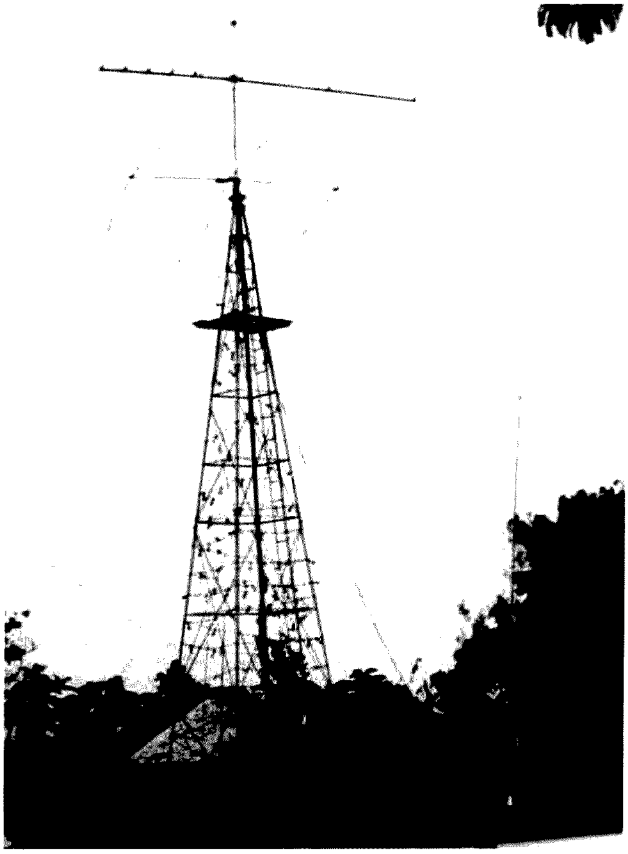


Photo B. The St. Kitts antenna farm included an 8-element 6-meter beam, tribander, dipoles, and a vertical.

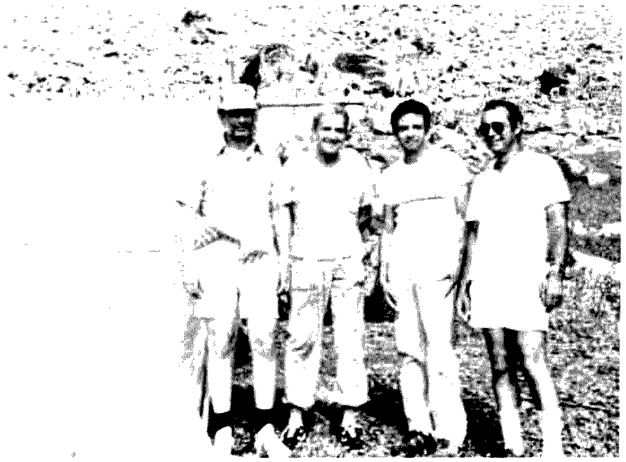


Photo C. The CW operating team at HKØTU in front of the "Malpelo Hilton." From left: HK1DBO, HK1QQ, HK1AMW, and HK3BAE.

Colombian amateurs formed the operating team at HKØTU, which finally landed on Malpelo on October 12 for a four-day stay. The group set up four stations, 3 on SSB and one on CW. The CW team of HK1DBO, HK1QQ, HK1AMW, and HK3BAE (see Photo C) made about 7600 contacts of the 20,000-plus total of the DXpedition. The CW operating position (a tarp thrown over some poles) prominently displayed a sign which read, "Malpelo Hilton. VIPs only. No phonepatchers allowed!"

The composite photograph taken from he top of the 1000-foot cliff overlooking he landing site gives some idea of the ugged nature of the island. Lacking the ssistance of military helicopters, the operators were forced to set up all their staons on the eastern side of the island, so ne US West Coast and Japanese amateurs once again found Malpelo a difficult ontact. The Colombian hams scouted ut the rest of the island during breaks in neir operating schedule; they located a ossible site on the western side of the land for a future DXpedition, which nould please W6 hams. Don't hold your eath, however; the next Malpelo trip is ntatively scheduled for 1990!

That's it for now. Coming up: the wonous WWV!

ARGENTINA INVADES ANTARCTICA

No, not another Falklands/Malvinas nooting-type war. DX contacts are the ajor weapon in this battle of internaonal diplomacy. Specifically, AZ5ZA ed a shot in favor of the Argentine's aim to the polar regions by operating ring the month of January (middle of summer) from the South Orkney Islands group, between South America and Antarctica.

With the kind assistance of the Argentine Navy, two amateurs traveled to Laurie Island to activate AZ5ZA (which is a legitimate Argentine callsign). Carlos Poffo LU9EIE and Art Gargarella LU6ETB braved the elements and the prospect of Christmas in one of the worst climates in the world to put this island on the air.

While the action might not be quite as exciting (nor as deadly) as the ill-fated attack on the Falklands, this DXpedition is really another skirmish in the long-standing disagreement between the United Kingdom and Argentina over the ownership of vast amounts of Antarctic real estate and (more importantly) ocean-fishing and mining rights.

At stake in such apparently innocent DXpeditions is the 200-mile limit which most countries recognize as "territorial waters." Argentina has always taken its claim to the nearby islands and a slice of the Antarctic continent very seriously. Maps of the country printed in Argentina always show a huge slice of Antarctica and the surrounding islands as part of Argentina. If Argentina can win international support for its claim to these disputed regions, the country stands to gain fishing, drilling, and undersea-mining rights to an enormous area, potentially worth many billions of dollars.

The Argentines have pursued their claims to this region through international courts as well as on the battlefield and have never acknowledged the United Kingdom's claims to the same territory. Since one of the bases for international recognition of the territorial claims is inhabitation and development, the Argentine Navy "shows the flag" in this region as often as the nasty weather permits. This year it's South Orkney. Meanwhile, a small community of British subjects stays on the next island to the south, Signy Island, also part of the South Orkney group. Listen for VP8s AOD, AOH, and ALD.

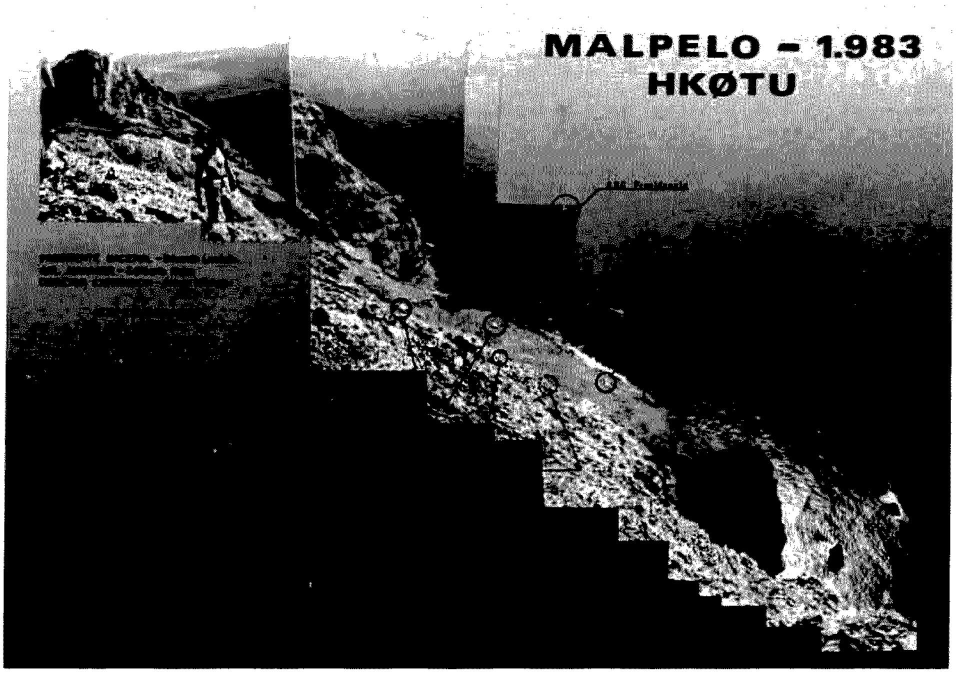


Photo D. The HKØTU operation as seen from the top of the cliff high above the stations. "Fonia" indicates a phone station, while "telegrafia" indicates a CW position.

Fortunately for DXers, the international ramifications of these disputes do not (yet) affect the DX status of the "country." South Orkney is a new one for hams, regardless of whether the contact is with a VP8 or LU (AZ) operation. But don't try to confirm your AZ5ZA contact through the United Kingdom! The Radio Club of Argentina, one of the sponsors of the DXpedition, advises that the QSL route for AZ5ZA is via LU2A, Box 100, 1428 Buenos Aires, Argentina.

While it is unfortunate that amateur radio is being used as a pawn in the difficult game of international law, at least the DX community gains some major DXpeditions to otherwise inaccessible spots, financed by the respective governments. Let's hope that all shots fired are in the form of "CQ DX."

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

DXING AND DXPEDITIONS

I have many wonderful dreams and desires. Most of them I can't describe in a magazine that caters to readers of all ages, but one great dream I can write about is my wish to travel on a real, honest-to-goodness, 100-percent-genuine DXpedition.

During my youth, while other kids were drooling over pictures of Corvettes and ten-speeds, I used to fantasize about packing up my station (a Heathkit Sixer and a Trick Stick) and setting off on a journey to the highest peaks of the Swiss Alps, there to work the world on 50-MHz AM. Okay, I know six meters isn't legal in HB-land, but remember, this was a dream.

Today, my goals aren't quite so lofty. I no longer dream of giving a new country to tens of thousands of eager amateurs. Instead, I would happily settle for a journey to any reasonably remote destination. All I ask is that this place be warm, have relatively decent propagation characteristics, and feature a hospitable populace (no gunfire, please).

Will I ever achieve this goal? Who knows? So far, my total DX operating experience consists of an Icom IC-2A that I secretly slipped into 4U1-land (4U1-block?). Unbeknownst to the dozens of surrounding security guards, I actually kerchunked K2KLN/RPT from foreign territory. (Well, the ARRL says it's a foreign country. I call it East 42nd Street.)

So there you have it—a ham and his dreams. I'm open to offers.

ELEMENT 1
MULTIPLE CHOICE

1) On 160 meters, the DX window is:
   1) 1975-2000 kHz
   2) 1100-1560 kHz
   3) 1875-1900 kHz
   4) 1825-1830 kHz

2) Soldiers of which nationality fired at DXers during the recent Spratly Island fiasco?
   1) North Korean
   2) Vietnamese
   3) Cambodian
   4) Laotian

3) Which of the following groups *does not* sponsor DXpeditions:
   1) Yasme Foundation
   2) Private individuals and radio clubs
   3) Northern California DX Foundation
   4) ARRL Foundation

4) Back in the 1950s, FCC Form 405A was used for:
   1) Amateur-license renewals
   2) TVI complaints
   3) Amateur-license revocations
   4) CB-license applications

5) Which of the following *is not* a time and frequency station:
   1) CHU
   2) JJY
   3) ZUO
   4) IBE

ELEMENT 2
MATCHING

Match the renowned DX operators in Column A with their calls in Column B.

Column A	Column B
1) Father Michael Moran	A) XY1W
2) Martti Laine	B) 4S7PB
3) Tim Chen	C) W6AM
4) Paddy Gunasekera	D) VP2ML
5) K. Venkataramanan "Venkat"	E) BV2A
6) Don Wallace	F) OH2BH
7) Tom Christian	G) ON4UN
8) Johan "John" Devoldere	H) VU2KV
9) Chod Harris	I) 9N1MM
10) Lloyd Colvin	J) VR6TC
	K) W6KG

ELEMENT 3
TRUE-FALSE

	True	False
1) A 1-land station that works Western Europe with an antenna pointed east is working the short path.	____	____
2) Over-driving your transmitter is called flat-topping.	____	____
3) The 75-meter phone allocation for USSR amateurs ranges from 3.9 to 4.0 MHz.	____	____
4) The first two-way, transatlantic QSO took place in 1912.	____	____
5) Most RTTY DX is found around 14.090 to 14.100 MHz.	____	____
6) The highest altitude DXpedition was one that took place on top of California's Mt. Whitney (14,495 feet).	____	____
7) The Worked All Continents award is sponsored by the ARRL.	____	____
8) The Africana Net meets on 10 meters.	____	____
9) If a DX station on CW sends "U5," it means "stand by for five minutes."	____	____
10) As of 1978, DXpeditioners Lloyd and Iris Colvin had traveled to over 133 countries and worked over half of the active amateurs in the world.	____	____

ELEMENT 4
FILL IN THE BLANK

1) To ______ is to call a DX station at the same time another operator is signing off.
2) Very long distance DX is often called ______ operation.
3) The ham who relays a list of station calls to the DX operator is often called the ______.
4) An ______ is a document that may be converted into postage in another country.
5) To ______ is to adjust your transmitter to the same frequency as the DX station.

THE ANSWERS

Element 1:
1—4, 2—2, 3—4, 4—1, 5—4.

Element 2:
1—I, 2—F, 3—E, 4—B, 5—H, 6—C, 7—J, 8—G, 9—D, 10—K.

Element 3:

1—False	Only if using a broken compass.
2—True	Of course, only contesters are guilty of this—never DXers.
3—False	3.6 to 3.65 MHz.
4—False	No, 1923.
5—True	When the CW guys aren't trying to kill the signals.
6—False	I think W5LFL broke that record.
7—False	Technically, it's an International Amateur Radio Union certificate.
8—False	On 15 meters.
9—False	You should go up five kHz.
10—True	That adds up to a half-million QSOs.

Element 4:
1—tail-end
2—long-haul
3—master of ceremonies (MC)
4—international reply coupon (IRC)
5—zero beat

SCORING

Element 1:
Five points for each correct answer.
Element 2:
Two and one-half points for each correct match.
Element 3:
Two and one-half points for each correct answer.
Element 4:
Five points for each word correctly filled in.

Are you a ham of the world?

1-20 points—Repeater fan
21-40 points—Armchair DXpeditioner
41-60 points—Half-way through the DXCC ranks
61-80 points—Honor Roll material
81-100 points—DXCC in countries visited

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

March blows in like a lion, and so did a letter I received this month from John Gist KD6LP/Ø in Hazelwood, Missouri. John's letter takes the "tell-it-like-it-is" award, for taking me to task on the selection of the VIC-20 as the computer end of Microlog's AIR-1 RTTY system.

Without reprinting John's four-page letter, I will relate that he is totally satisfied with his VIC-AIR combo and feels that he is missing nothing with the setup. He notes that large letters are not a decrement if your vision is poor. As an aside, the earlier Microlog equipment featured such large type for those with poor acuity or to allow the screen to be read across the room. The price is right, the features appear to be good, and the users are happy; what more can I say?

Now, the flip side of it is the wish that, since the VIC uses the same 6502 that several other "low-end" computers use, Microlog would consider producing versions for those systems as well. Also, since the stand-alone Microlog units have always used 6800-series microprocessors, why not cross-assemble one for the CoCo? The 16K cassette-based bottom line CoCo is quite a bargain, and when you upgrade it... but more about that later.

Thanks for the note, John; I think we have given this one enough AIR, don't you?

A close runner-up for the "t-i-i-i" award is a card I received from Eark Morris from Midland, Michigan, regarding the RCA offer to sell ASR-33s for $300. He states, "These machines are selling around here for $50 to $75. Why spend $300 for an old Teletype when for $400 you can buy a new dot matrix printer? Most people who purchased 33s for computer use are now trying to sell them since they have purchased a real printer. Now, Model 1[illegible] Teletypes are a different story. Those yo[illegible] can't even give away anymore! Everyon[illegible] has been buying VIC-20s." I wonder if Ear[illegible] has been talking to John? Oh, well...

Hams on the frontier of technology co[illegible]tinue to fill us all in on the techniques an[illegible] nuances of some of the newer RTT[illegible] modes. With AMTOR, particularly, indivi[illegible]ual observations tend to provide a lot of i[illegible]formation. For instance, Carty Ellis KA2[illegible] writes of his and his son's (KS2Z) activi[illegible] on both RTTY and AMTOR for the past fe[illegible] months. Their station includes a VIC-[illegible] with the Kantronics HAMTEXT and A[illegible]TORSOFT programs, and AEA CP-1 inte[illegible]face, and a barefoot eighty- through te[illegible] meter transceiver.

"Let me share some observations [illegible] equipment, documentation, assistanc[illegible] and on-the-air experiences. We original[illegible]

wanted to try using our Atari 400 computer on the air. A local amateur was kind enough to loan us his Kantronics interface unit and the HAMSOFT program for the Atari. We were pleasantly surprised at how easy it was to get on RTTY. One comment we had heard on the Kantronics Interface was somewhat negative, (that) the received signal had to be S9 or better for reliable copy. We did find this to be true in our case. For that reason, as well as a desire to be able to hook up an oscilloscope to aid in tuning. . .(we ordered) the CP-1. I can do nothing but rave about the CP-1! It is very selective, far easier to tune without a scope. . .and it will copy signals that I can barely hear through the speaker. I can really be proud of that selection.

"As far as the Kantronics software—I have to give them a solid A on that. The only rap on the knuckles for the software is two documentation problems. On both HAMTEXT and AMTORSOFT they do not explain why you need to affirm that you are using their software with their interface or with someone else's. This 'game' results in your RTTY or AMTOR signal being 'upside-down' if you didn't make the right choice. This is your *transmitted* signal, not the one you are receiving—(I haven't discovered if the situation is an inverter in the Kantronics AFSK generator or actual program logic; however, I suspect the prior—so watch it on your first RTTY and AMTOR QSOs (or lack of QSOs). And for those of you who say, 'Why didn't he try the reverse switch on the interface?'—a) that only affects the received signal, which is OK, and b) properly written software does not require user experimentation for proper use.

"The problem with AMTORSOFT is more one of interpretation; AMTOR is a new mode—procedural protocol is still changing, some of the techniques are really exotic (very impressive is a better phrase)—and it all takes a lot of learning. The technique of establishing a raw, unscheduled contact on AMTOR is not real life—it would work, just nobody does it that way. And there is a feature of AMTOR which makes it a bit like OSK CW—you can actually break into the other station while he is sending to you—try that on RTTY. And last but not least—one 'lid' thing can happen to you—you can be trying to find the SELCAL being used, and if you forget to tell the computer NOT to respond—you may find yourself actually screwing up the link between two stations who are in QSO—that really gets embarrassing for the new ham doing it and frustrating for the two stations who are otherwise in 100% perfect copy situations."

My sincere thanks to Carty for a meaty letter, which I am sure many hams toying with the idea of getting on AMTOR appreciate.

Now, a short tale of two computers. Many of you have dropped me notes telling me of your use of the VIC, Atari, or other personal computers on RTTY. I noted in these pages some months back of my acquisition of an Atari 400, with the hopes of putting it on RTTY. Well, now you may note that I am talking about a TRS-80C Color Computer® with the same lines. My computer history goes back to the 6800 school, as faithful readers of this column know, and it is from that school that the 6809 used in the CoCo comes. After looking at several systems and spending quite a bit of money, not all of it wisely, I have come to the conclusion, at least for now, that the 6809 is the way to go. Points in its favor include ease of programming, a wide range of system software, and a wide range of hardware which retains compatibility. There are at least three or four disk operating systems, each of which fills a different niche, and hardware systems which range in complexity from Color Basic CoCos, selling for a little over one hundred dollars, to GIMIX OS9 systems and Cheftains, selling for thousands. This is no toy, the 6809, but that does not mean you can't play games. For a three-year-old version of CoCo RTTY, look at Clay Abrams' article on page 58 of the September, 1983, issue of *73*. We will present more here, as it develops!

As I reread the above paragraph, I see I mentioned one thing that, if not explained, leaves unsaid why I feel the 6809 is so powerful. Those of you who read any of the computer magazines have read about the "big" system operating systems, like Unix or Xenix. These multi-user operating systems allow several users to share a central CPU and disk, with only a remote terminal. Except for certain high-use times, such users are typically unaware of other users' existence. That is what OS9 is, a multi-user, multi-tasking operating system for the 6809 CPU. Two users can run my CoCo with a "background task," say printing out a listing, all going at the same time. Because of hardware design, there is a bottleneck with simultaneous input and output, but other tasks can run at the same time. The bottleneck is caused by the use of a parallel port PIA as a serial port, through use of a software UART. This was used in early 6800 systems and has been used here as one way to interface RTTY with a computer. It does tie down the CPU, though, and when a true serial port, ACIA, is implemented, it will help. But in the meantime, a CoCo running OS9 runs rings around other systems. Check it out.

You are a vocal lot, RTTYers. I enjoy reading your comments, views, and opinions, and so do your cohorts. Let me hear from you, and I'll pass along what I can, filter some more, and add what's needed. The product? Next month's RTTY Loop.

FCC

ssuance of Ten Year Amateur Radio icenses

GENCY: Federal Communications ommission.

CTION: Issuance of licenses.

UMMARY: The Commission has ommenced issuing new, modified and enewal amateur radio station and perator licenses for ten year terms. The nger-term licenses were authorized in le amendments previously adopted in is proceeding. Issuance of ten year censes was delayed so that necessary anges could be made in licensing ograms. The Public Notice is cessary so that licensees will know at we are now issuing ten year censes. The effect of this Public Notice the creation of an informed public and reduction in the number of telephone quiries concerning license terms.

DRESS: Federal Communications mmission, Washington, D.C. 20554.

R FURTHER INFORMATION CONTACT: aurice J. DePont, Private Radio reau, Special Services Division (202) 2-4964.

PPLEMENTARY INFORMATION: The port and Order in this matter was blished on October 28, 1983 at 48 FR 861.

The Commission has commenced uing new, modified and renewal ateur radio station and operator enses for ten year terms. The longer-m licenses were authorized in rule endments adopted by the mmission on October 6, 1983. Before rules were changed, an amateur ense was issued for a five year period. uance of ten year licenses was layed so that necessary changes could made in licensing programs. (PR Dkt. -337).

There will be a two year grace period expired ten year station and operator enses.

The Commission emphasizes that the ten year license term is not a blanket extension of existing station and operator licenses. An amateur license that specifies less than a ten year term will show a ten year term on the face of the license when it is either modified or renewed.

William J. Tricarico
Secretary, Federal Communications Commission.

Amendment of the Commission's Rules To Make Additional Frequencies Available for Repeater Operation

AGENCY: Federal Communications Commission.

ACTION: Withdrawal of proposed rule.

SUMMARY: This document withdraws an earlier proposal which sought to make additional frequencies in the 10 meter band available for repeater operation. Making such frequencies available to users would have an adverse impact on amateur satellite communcations in that band. Further, it was determined that there is no compelling need for repeater subband expansion in the 10 meter band at this time.

ADDRESS: Federal Communication Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT: Maurice J. DePont, Private Radio Bureau, Washington, D.C. 20554, (202) 632-4964.

Order; Proceeding Terminated

In the Matter of Amendment of the Amateur Radio Service Rules, Part 97, to make additional frequencies available for repeater operation. PR Docket No. 83-485; RM-4231.

Adopted: October 31, 1983.
Released: November 2, 1983.
By the Commission.

1. On May 12, 1983, the Commission adopted a Notice of Proposed Rule Making (48 FR 24954; June 3, 1983) proposing to amend the Amateur Radio Service Rules to authorize the frequencies between 29.0 and 29.5 MHz for repeater operation. Current frequencies available for repeater operation in the 10 meter band are between 29.5 and 29.7 MHz. Comments in the proceeding were due July 25, 1983, and reply comments were due August 24, 1983.

2. The Commission's proposal stemmed from a petition for rule making (RM-4231), filed October 13, 1982, by Beryl Gosney of Oak Harbor, Washington. Mr. Gosney requested that frequencies in the 10 meter band now available for repeater operation be expanded to include frequencies between 29.0 and 29.5 MHz. In his petition, Mr. Gosney said that the present number of 10 meter band frequencies was inadequate and that severe frequency congestion was taking place. He attributed the congestion to the recent increase in FM communications that has taken place on 10 meters, but offered no data to support his claim. In our proposal, we noted that there might be merit in the petitioner's request and invited comments on the need for additional repeater frequencies. We also asked for comments on the impact that additional 10 meter frequencies would have on present and future repeater and non-repeater operations.

3. Commentors in favor of the proposal said there was a great need for the additional repeater frequencies. For example, the Southern California Repeater and Remote Base Association (SCRRBA) said that it was unable to coordinate additional repeaters, even though there are operators in that area who want to construct and operate new stations. SCRRBA acknowledged that there are satellite operations in the 29.3–29.5 MHz portion of the 10 meter band, but anticipated that sharing arrangements with Amateur-Satellite Service users could be worked out within the amateur community. Carl E. Bollinger stated that there is a great need for these additional frequency allocations on FM. According to Mr. Bollinger, under favorable propagation conditions, there is extreme crowding and interference on both the repeater and simplex frequencies.

4. Commentors opposed to the proposal mentioned the disruption that would occur to amateur satellite communications if repeaters were permitted between 29.3 MHz and 29.5 MHz. The Radio Amateur Satellite Corporation (AMSAT) said that FM repeater operation in that frequency segment would worsen an already difficult situation. The American Radio Relay League, Inc. (ARRL) concurred. In addition, the ARRL said it had no evidence of overcrowding in the existing 10-meter repeater subband. The ARRL noted that its latest Repeater Directory listed only 43 repeaters in the 10 meter band for the entire United States, and only one repeater in the State of Washington, where the petitioner resides.

5. After considering the comments on both sides of the issue of additional 10 meter repeater frequencies, we are persuaded, for two reasons, that we should terminate this proceeding without adopting the proposed rules. First, providing additional repeater frequencies in the 10 meter band would have an adverse effect on amateur satellite communications, including beacon transmissions, robot operations, telemetry signals and transponder downlinks. Second, we conclude that there is no compelling need for repeater subband expansion in the 10 meter band at this time. Comments referring to congestion on repeater frequencies appear to represent local conditions. Amateur satellite communications, on the other hand, transcend local areas. Hence, the adverse impact on amateur satellite communications that would occur if the subband were expanded, outweighs any frequency congestion that local repeaters may be experiencing.

6. In view of the foregoing, it is ordered, That the petition of Beryl Gosney, RM-4231, is denied.

7. It is further ordered, That this proceeding IS TERMINATED.

8. Information in this matter may be obtained by contacting Maurice J. DePont (202) 632-4964, Private Radio Bureau, Federal Communications Commission, Washington, D.C. 20554.

Federal Communications Commission.
William J. Tricarico,
Secretary.

DR. DIGITAL

Robert Swirsky AF2M
PO Box 122
Cedarhurst NY 11516

I have a tendency to get carried away. When someone asks me what is thought to be a simple question, that person is usually sorry he asked; I tend to give lengthy replies. This was the case the other day when a friend asked me about a certain programming technique.

My friend was working on a net-control management program and wanted to know how to have a "first-in-first-out" sequence for the data. Obviously, after the check-ins are noted, the net control must respond to them in the order that they checked in. One solution is to store the check-ins in an array. This, however, presents a number of problems. One must know the maximum number of check-ins that can "pile up" before the net control can get to them. Also, there is the problem of how to handle the situation where a new station checks in before all the previous check-ins have been taken care of—if the first check-in of the initial group is in array element #1, the only way would be to move all the other elements up one space. Clearly this is a waste of time; on a microcomputer with a slow Basic, this can take a few seconds.

Since we were discussing programming languages last month, I'll use this problem to show how a programming problem that is hard to code in Basic is almost trivial in a different language.

Programming Language

A number of years ago, a committee from IBM decided to invent a new programming language (well, maybe the decision was made and then the committee was formed, but let's not pick nits). After a long period of heated debates, they came up with PL/I. This language took the best features of FORTRAN, COBOL, and ALGOL as well as a bunch of other stuff never before seen in a programming language and integrated them into one huge language. In its present form (PL/I-F), it includes practically every feature one can imagine: concurrent subroutines, exception processing, modular programming, and the ability to communicate with other languages. There are even forms of the language that will try to correct syntax errors.

The problem with PL/I was that is was *too* big. In order to deal with this, another committee (ANSI) sat down and removed all the redundant and seldom-used features of the language and produced PL/I subset G. This was done primarily to meet the needs of minicomputer users. When subset G was designed, memory pieces were still high and minicomputers didn't have much more memory than some of today's microcomputers.

It wasn't long before some other committee decided to trim some more fat off PL/I and make it fit on microcomputers. This was done by Digital Research (the company that markets CP/M) in 1980. Their product was called PL/I-80 (the 80 refers to the fact that it runs on an 8080 or Z-80 based computer). Because I am a PL/I fanatic, I obtained a copy of PL/I-80 as soon as it came out and have had a love/hate relationship with it ever since.

The "love" is because I feel it is one of the best microcomputer languages around. The "hate" is because of the subtle differences between PL/I-80 and "real" PL/I. I have a great deal of difficulty transferring programs between PL/I-80 and DEC PL/I, even though both are called "subset G." Still, I have no reservations recommending PL/I-80. It is available for any system that can run CP/M-80 (even Apple computers with a Z-80 card).

Queues

The way to handle the "first-in-first-out" net-control problem is with the data structure know as a "queue." A queue simply means a line, and this provides a useful analogy. When one goes to see a movie, one generally waits in a line. New people can only enter the line from the rear (we'll assume we live in a perfect world and nobody cuts), and a person can only get off the line from the front. This is exactly the type of organization we need for the net-control program—new check-ins get on the rear of the line while the net control handles the people on the front of the line.

Listing 1 shows the PL/I program to handle this. It allocates blocks of memory, called "nodes," for each person who checks in. Associated with each node is a pointer called "next" which points to the next person on line. There are also two other pointers called "front" and "rear" which point to the front and rear of the queue. Subroutines are provided to add a new node at the rear of the queue, to remove a node from the front of the queue, and to see if the queue is empty. Following is a line-by-line description of the program.

Line 1 is the standard way to begin a PL/I program. This identifies the program name as QUEUE and tells the computer that this is the main program, as opposed to a subprogram.

The form of each node is specified with lines 8 through 9. The DCL stands for "declare." Each node is to consist of an 8-character callsign field and a pointer to the next node. Note that this declaration does not actually reserve any memory for the node. It simply serves as a template to indicate the structure of each node. Line 7 says "BASED (Q)." This specifies that the variable Q will be used to hold the memory address of the queue's location.

Other variables that will be used in the program are specified in lines 12 through 16. Line 12 means that Q is a "pointer" variable; it is used to hold a memory address. The declaration in line 13 tells the computer to reserve 8 memory locations for character data and reference this location by the name "INFO." A "fixed" variable (line 14) can contain integer data between the values of −32768 to +32767. Finally, the variables that will hold the addresses for the front and rear of the queue are specified in line 16.

PL/I programs are generally divided into smaller units called "procedures." These are similar to Basic subroutines. The procedures or subroutines for this program start at line 18. The first one is called INIT-QUEUE. All this does is initialize the queue; the pointers to either end of the queue are set equal to NULL, which is a built-in system variable used to indicate an invalid memory location. The queue can be checked to see if it is empty by determining if the pointer is equal to this null value.

We start to get to the more interesting part of the program at line 23. This procedure, called ADD-REAR, is used to add a new callsign to the end of the queue. The ALLOCATE statement (line 26) reserves enough memory for one node and sets the variable Q equal to the address of this

Listing 1. This program demonstrates the use of a queue for a net-control management problem.

```
 1: QUEUE:PROC OPTIONS (MAIN);
 2:
 3:
 4:
 5:
 6:     DCL
 7:         1 NODE BASED (Q),
 8:           2 CALLSIGN CHAR (8),
 9:           2 NEXT POINTER;
10:
11:
12:     DCL Q POINTER;
13:     DCL INFO CHAR (8);
14:     DCL I FIXED;
15:
16:     DCL (FRONT,REAR) POINTER;
17:
18:   INIT_QUEUE:PROC;
19:        FRONT=NULL();
20:        REAR=NULL();
21:   END;
22:
23:   ADD_REAR:PROC(INFO);
24:    DCL INFO CHAR (8);
25:
26:    ALLOCATE NODE SET (Q);
27:    Q->CALLSIGN=INFO;
28:    Q->NEXT=NULL();
29:    IF REAR=NULL() THEN
30:       FRONT=Q;
31:    ELSE
32:       REAR->NEXT=Q;
33:    REAR=Q;
34:  END ADD_REAR;
35:
36:   REMOVE_FRONT:PROC RETURNS (CHAR(8));
37:   IF EMPTY() THEN DO;
38:      PUT SKIP LIST ('QUEUE ACCESS ERROR');
39:      RETURN ('-ERROR--');
40:      END;
41:
42:    DCL TEMP POINTER;
43:    TEMP=FRONT;
44:    INFO=TEMP->CALLSIGN;
45:    FRONT=TEMP->NEXT;
46:    IF FRONT=NULL() THEN REAR=NULL();
47:   FREE TEMP->NODE;
48:   RETURN (INFO);
49: END;
50:
51:
52:   EMPTY:PROC RETURNS (BIT(1));
53:    RETURN (FRONT=NULL());
54:   END EMPTY;
55:
56:   CALL INIT_QUEUE;
57:
58:   MAINLP:DO WHILE ('1'B);
59:     PUT SKIP LIST ('1. ADD CALL TO LIST');
60:     PUT SKIP LIST ('2. REMOVE CALL FROM LIST');
61:     PUT SKIP;
62:     GET LIST (I);
63:
64:     IF I = 1 THEN DO;
65:      PUT SKIP LIST ('CALL -->');
66:      GET LIST (INFO);
67:      CALL ADD_REAR(INFO);
68:     END;
69:
70:     IF I = 2 THEN DO;
71:      IF EMPTY() THEN
72:       PUT SKIP LIST ('LIST IS EMPTY');
73:      ELSE DO;
74:       INFO = REMOVE_FRONT();
75:       PUT SKIP LIST (INFO);
76:      END;
77:     END;
78:   END MAINLP;
79:  END QUEUE;
```

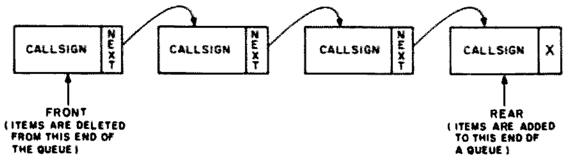


Fig. 1. What a queue looks like. Each rectangle represents a node.

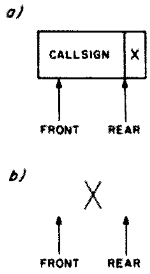


Fig. 2. (a) A queue containing only one node. (b) A queue containing no nodes and both front and rear point to NULL, represented here with an X.

memory. It then takes the callsign field of the node and inserts the proper information into it. The node is then linked to the rest of the chain of nodes by taking the "next" field of the existing rear node and setting it equal to the address of the new rear node. The value of the REAR variable is then updated to reflect this change. (See Fig. 1 for a diagram of what queue looks like.)

The other operation we need, that of removing a callsign from the front of the queue, starts at line 36. If the queue is empty, this subroutine prints an error message. If not, it removes the front element of the queue and saves the callsign information. The FRONT variable is then updated to point to the next element on the list (line 45), and the old FRONT node is discarded (line 47). The statement on line 47 frees the memory that was used for the node so that it can be used again. It would be helpful to think of memory as being a pool of nodes; the ALLOCATE statement takes a node from the pool, and the FREE statement dumps a node back into the pool.

In order to see if the queue is empty, the procedure starting at line 52 checks to see if the FRONT pointer is equal to the null value. An empty queue is shown in Fig. 2(b). Both the front and rear pointers point to the null value, represented by an "X". Also, note that a queue can have one element—Fig. 2(a). In this case, the front and rear pointers both point to the same element.

The main program starts at line 56. After the queue is initialized, it gives the user a choice of adding a call to the end of the list or removing a call from the front of it. If option 1 is selected, the program asks for the callsign and calls the ADD-REAR procedure. If option 2 is selected, the program calls the REMOVE-FRONT procedure and prints the callsign on the display. See Listing 2 for a printout of a program run.

Obviously, this is far from being a complete net-management program. After the check-ins are acknowledged, it would be useful to put them on another form of a list. A circular list might be a useful structure to use. This can be created by having a queue where the rear element points to the front element. With the calls in a circle, one can keep going around the list, thus periodically seeing if the stations are still there.

As you can see, PL/I is very different from Basic. The block structure of a PL/I program, as well as the ability to declare structures of data and refer to them by addresses (pointers), makes it easier to use for many programming projects. It does, however, have its disadvantages. The programs have to be compiled and linked before they can be executed—a process that can sometimes take up to two minutes, depending on the speed of the disk drives and the length of the program. If there is an error in the program, it has to be fixed using a text editor and recompiled before it can be run. This can be a slow process. However, it does encourage a programmer to get his program logic worked out *before* he starts to write the program; the user of an interpreted language is often tempted to work out the program logic as he is writing it!

Next month, I'll go into some other languages. It is hoped that this will provide you with an adequate sample of the various languages available for microcomputer users and will be helpful when you are deciding which language compiler to buy.

Listing 2. Sample run of the net-control program.

```
A>QUEUE

1. ADD CALL TO LIST
2. REMOVE CALL FROM LIST

1


CALL -->AF2M

1. ADD CALL TO LIST
2. REMOVE CALL FROM LIST
1


CALL -->WB2IBE

1. ADD CALL TO LIST
2. REMOVE CALL FROM LIST
1


CALL -->KI2U

1. ADD CALL TO LIST
2. REMOVE CALL FROM LIST
2

AF2M
1. ADD CALL TO LIST
2. REMOVE CALL FROM LIST
2

WB2IBE
1. ADD CALL TO LIST
2. REMOVE CALL FROM LIST
1

CALL -->W2NSD/1

1. ADD CALL TO LIST
2. REMOVE CALL FROM LIST
2

KI2U
1. ADD CALL TO LIST
2. REMOVE CALL FROM LIST
2

W2NSD/1
1. ADD CALL TO LIST
2. REMOVE CALL FROM LIST
2

LIST IS EMPTY
1. ADD CALL TO LIST
2. REMOVE CALL FROM LIST
```

LETTERS

FRESH AIR

Just picked up the November issue of *73* and I couldn't help but comment on a letter sent you by the gentleman who has refused for over fifty years to have his mind "cluttered . . . with code just to pass some test."

I can certainly remember the challenge I had as a youngster of twelve in earning that General ticket. The difficulty at the time, though, was understanding that electronic theory. As I recall, I couldn't quite understand why I was required to know all that theory when an understanding of telecommunications operation should suffice.

Fortunately, for some, the FCC has provided a portion of the radio spectrum for those of us who have not the inclination to clutter our minds with code or theory. Ten-four, good buddy?

Thanks for a refreshing breath of fresh air called *73* and best wishes for another prosperous year.

Lou Devillon K4ZRP
Jupiter FL

CB TO SHUTTLE?

This article was in my local newspaper this evening (New Bedford *Standard-Times*, New Bedford, Massachusetts, December 5, 1983). I thought that you might get a kick out of it. It is amazing what will get into print these days.

Chuck Doherty WB1AIP
So. Dartmouth MA

CBer claims to hear voice from space

By David Foster
STANDARD-TIMES STAFF WRITER

ACUSHNET — John Worthington was driving down Route 24 in Raynham Saturday night when his citizens band radio suddenly crackled with what seemed to be the voice of orbiting Spacelab Commander John Young.

Officials at Space Center in Houston were doubtful today that the conversation could have taken place, but said they would "check it out."

Worthington, of 339 Main St., said he talked to Young, who is orbiting the Earth in the space shuttle Columbia, for about a minute at 9:47 p.m. Saturday.

He recalled the voice as saying, "Spaceship Colombia, we are currently entering the east coast of the United States, broadcasting on 27.4 meghertz, channel 19. Does anyone between the states of New Jersey, New York, Connecticut and Massachusetts have the copy on us?"

Worthington, 44, a garage supervisor for The Standard-Times, said he acknowledge the transmission, but got no response at first. Young rebroadcast the entire message, and Worthington repeated his response, Worthington said today.

"At that point, he received me loud and clear. He asked me for my location, my call letters, which I gave him."

They conversed briefly, he said.

"He tried to get back to me again, but he started to fade out," Worthington said. "He said, 'Traveling at 12,000 miles an hour, I guess it's impossible for us to carry on a very long conversation.' And then he was gone."

"The thrill went down my spine like you wouldn't believe. You can dial the phone any time you want, but how often can you call outer space?" Worthington said.

A NASA spokesman said the agency couldn't be sure that Young didn't talk to Worthington, but said they would check it out. A spokesman for the American Radio Relay League, which represents ham radio operators, said it was impossible for a CB radio operator to talk to Spacelab.

"There's just simply no way," said Wayne Yoshida, from the league's office at Space Center.

Yoshida said ham operators are communicating with Spacelab, but that is on a completely different frequency.

For his part, Worthington is "99.9 percent sure" it was Young he talked to, and not an earth-bound hoaxer. "Hey, who can tell anything? I just know that if it was a ground station, he wouldn't have faded out."

Worthington said he plans to write a letter to Young to confirm the conversation.

CUCKOO'S NEST

I have hesitated to write this until both my blood pressure and NASA STS-9 were back to ground level. Many of us, including yours truly, were shocked, discouraged, and dismayed by the operational procedures of some hams during Owen Garriott's history-making flight aboard the *Columbia*.

Though there had been months of preparation regarding the operating frequencies to be used by Garriott and earthbound stations, dozens of hams insisted on calling W5LFL on his dedicated transmit frequency. As if that wasn't bad enough, all of the self-appointed "policemen" monitoring 145.55 MHz got on to chastise the offenders. All of which resulted in chaos on the frequency.

Some of the language heard during this period was downright embarrassing to listeners, both hams and SWLs. I heard of one ham who had gathered some non-ham friends around his rig in hopes that they would hear W5LFL on one of his passes. Instead he was embarrassed to hear language and behavior which would make channel 19 seem tame.

I, for one, am totally disgusted with the level of operation on the ham bands and on 2 meters in particular. It seems that we traded in our common sense, self-respect and basic intelligence when we received our ham licenses at the FCC office.

Maybe it is my past training in the US Army Signal Corps which causes me to be extra sensitive to careless operation. I was taught that if you don't know how to oper

ate your equipment properly on the correct frequency, you don't operate. Also, if you don't have anything intelligent to say, you maintain radio silence.

Now, don't go saying that I'm dragging the ham community down in the mud. There are thousands of dedicated men and women on the bands that do operate in a sensible fashion. To those people, I tip my hat!

Let's keep the bands free of the cuckoos. Maybe next time Owen flies over, he'll find more ham-ers than jammers.

Bill Shaughnessy KB1DY
Arlington MA

GRENADA CONNECTION

Wednesday, October 26, *The Boston Globe* front-page headline read: "US-Led Forces In Grenada...Two GIs Dead, 23 Wounded." *The Herald*, Boston's second daily paper, had this headline: "Two US Troops Die In Swoop on Grenada."

The news media was "tongue-tied!" No reporters were allowed on the island so nothing was coming out, and to prove it, both papers carried almost identical headlines. This is by no means a vendetta against the press, but throughout the years, with all the great technical advancements, the ham-radio operator is still the front line of communications to the outside world when a crisis breaks.

The key to the entire situation was the safety of the one thousand or more American students attending the two medical colleges on the island, St. George's and the American Medical School.

My vigil began on the 25th when I monitored an emergency frequency, 14.302 MHz, designated by the FCC to handle health and welfare traffic. The True Blue Campus at St. George's was the "hot spot" for the four pieces of traffic I received from concerned parents, which I passed to net control.

The following morning, 26 October, at 1245 zulu (8:45 am EDST), things began to really pop. Still monitoring the same emergency frequency, I could feel the crescendo building as more and more people became involved, when suddenly I heard an almost whispered message: "QSY to 350.9, QSL?" Roger. The point 9 caught my curiosity. That's a no-no; it's outside the regular band. Something must be cooking. Although I wasn't invited, I followed the two mysterious hams to their clandestine rendezvous. Bingo! I hit pay dirt.

"This frequency is operating by the authority of the FCC and the use of this frequency by any persons other than those designated by the FCC is prohibited and risks the penalties of illegal operations." This warning was repeated throughout the day.

I was not permitted to transmit on this frequency, but there is no law saying I cannot tape the information that was being passed between those who had the authority.

Mark KA2ORK was the Grenada connection. He was a student at the American Medical School and he did a tremendous job. Cool, absolutely cool. Hour after hour he went on handling all kinds of traffic: "The Marine Commandant is aware that your food and water supply is running low," "the four students you were concerned about who live off campus were contacted and are OK," "we received, though we think it's corny, from the State Department, 'Cavalry is coming up through the Canyon'—we will pass it along anyhow."

My tape recorder was getting "red hot," so I called the ABC TV affiliate station for the Boston area and played a short blast for the news manager. Within twenty-five minutes, 1505 zulu (11:05 EDST), one of their top reporters and a two-time Pulitzer-Prize-winning photographer were sitting in my shack, glued to my receiver and tape recorder. Mark was really feeding us like a gang of kids waiting for the ice-cream man!

There was a phone patch between John Copycinski, a staff member at St. George's Medical School, and his wife, Rose, in Newark, New Jersey, coming over the air while the lights and camera were being set up in the shack. "Hi, honey, I am doing fine and everyone here is doing a great job. I'm coming home soon. Right now we are waiting for the Marines to land on the beach and there has been some fighting. All the students are safe and OK. They will probably evacuate us soon. Don't you worry, now. Give that little Polish princess, Stephanie, a great big kiss for me. Don't worry, you will soon see my smiling face coming through the door. I love you and miss you. Over."

During their three-hour stint, Jim Boyd, the reporter, kept in close touch with his station, while Stanley Foreman did his lights, action, and camera bit, including a one-on-one interview between Jim and me.

All of which resulted in a five-minute lead-in segment on their TV station (Channel 5) 6:00 pm news program. I was told the President of the US does not get that kind of coverage.

The Boston Herald asked for my tapes and did a two-column story on the following morning. And local radio station WEEI called and did a phone interview with me.

So, the hams were "cooking" while the media was "stewing." Thank you very much, Mark Barettella KA2ORK of Ridgefield, New Jersey, my Grenada connection. 73.

Bill Sidell WA1HXQ
West Newton MA

MASSACHUSETTS GOVERNOR PROCLAIMS HAM RADIO WEEK

Declaring that hams all over the world are always in the front lines of communications during every crisis (Grenada) as well as devote themselves daily to the safety, health, and welfare of the general public, Massachusetts Governor Michael S. Dukakis signed a proclamation designating November 7-12 as Ham Radio Week.

Shown (left to right) are Dick Lindzen KA1SA, Irv Geller K1ON, Bill Sidell WA1HXO, Paul Dumais W1LJO, Tony Ruggelo K1CET, and Neal Lipson K1NDF, all members of the Middlesex Radio Club of Newton, Massachusetts.

QTH SWAP

During the period between the beginning of July and the end of October, 1984, my wife and I intended to revisit the western states of the USA which we toured extensively in 1981. On this occasion, however, we would like to exchange our home, car, and station for a period of about three months with a ham living somewhere not too far from the west coast of the US. What we would like from the exchange would be the use of a modest but well and suitably equipped motor home to permit touring around the western states.

The Isle of Man is a very beautiful island which is green and lush at all seasons. It is unspoilt by industrial developments with a much slower pace to life than on the English mainland. We do not, however, achieve southern California temperatures, even in high summer, being nowhere more than six or seven miles from the sea.

I would like to hear from anyone interested in the above offer of an exchange of QTHs, and of course will reply to all who may wish to enter into further detailed discussion.

Jack Etherington GD5UG
66 Douglas Street
Peel, Isle of Man
British Isles

•See List of Advertisers on page 114

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 6

Some would key the rig, most wouldn't. None would both key and modulate. Eventually I found the KLM mike—worked fine, once I'd found it. Now why is it so difficult to have some standardization on mike connectors? Come *ON*, you manufacturers.

Okay. Receive on 145.55—no problem. I decided to use the tunable vfo for the receiver and the synthesizer for transmitting so I could switch between 144.91-.93-.95-.97-.99- 145.01-.03-.05-.07-.09 quickly. My HT on 145.55 zeroed in the receiver and I was ready to roll.

The rig seemed to be working fine, with all sorts of guys chirping in on the .55 channel before the expected orbit, complete with others telling 'em to get the hell off the downlink channel and others testily demanding call-letter identification by everyone breaking in. The usual crapola.

About five minutes before the orbit, the uplink channels began to fill with callers. It sounded just like a DX pileup on 20m. I checked all of the ten uplink channels and found all ten piled high with signals. Having operated from planes many times over the years, I doubt if LFL could sort anything out of that mess. Even at two or three miles up, the channels turn to garbage as several stations try to use the channel at once.

Some ops, confused by the complexity of having to transmit on one channel and receive on another, got the two mixed up, filling the uplink channel much of the time with alternating calls and put-downs. I don't know if anyone else waited to hear LFL before calling (it didn't sound like it on the uplink channels), but I held my peace, waiting to hear if *Columbia* was even going to be on on this orbit. Silence from above.

The chorus kept up for the twenty minutes of the orbit, plus about five minutes on either end just in case. What a jungle.

1984 *CALLBOOK*

Despite the ARRL trying to put the venerable *Callbook* out of business, the new edition came out. I don't know why the *Callbook* seems to be so much more up to date than the ARRL version, but it sure does. At any rate, the 1984 *Callbooks* arrived ($19 each for the US and foreign editions), so after making sure that I am still alive, I checked out the US ham census figures to see how many new hams we have.

It's easy to see why most of the ham dealers have gone broke and why we have so few American ham manufacturers these days—hardly any new hams. The overall increase was about 2.6% over 1983—pitiful. Novices are up 9.4% this year. Techs are up 0.5%. Generals are down 0.7%. Advanceds are up 1.3%. Extra class is up 7.2%. That's awful!

In the heyday of amateur radio (1946-63), we grew at 11% per year steadily. Since 1963, the average growth has been the same as this last year—2.6%—and that's for twenty years now. Indeed, if we had not stopped our growth short in 1963, we would today have over two million US hams—just double the Japanese ham population, which makes sense when you figure that they have almost exactly half our total population.

Would we have lost one after another of our consumer electronics industries if we'd kept up supplying our country with career high-tech people via amateur radio? I think not. I've written about this for several years now, but I haven't seen any signs of anyone really giving a damn. I am bringing it up again because I've seen some magazines poo-pooing this with claims that we're back into a much higher ham growth. Well, we aren't. Nothing has been done to improve matters yet.

FOREIGN HAM SUBSCRIPTIONS

A couple months ago, I wrote mentioning that many hams in many foreign countries have currency restrictions which make it almost impossible for them to get *73*. Hundreds of readers have been kind enough to send in gift subscriptions to help these DX hams and I've been getting copies of the letters of thanks which have been forthcoming. It's almost sad to see how appreciative these lucky chaps are of your thoughtfulness. Try it and see for yourself. The regular DX subscription is $45, but if you send $25, I'll go the other $20 and we'll let more DX hams know that we Americans are the good guys.

73 INTERNATIONAL

from page 78

lot of customers. Waiting for the pileup, I told Bill it was my birthday (40 years). I spent the following two hours receiving reports and greetings. When the propagation changed, I turned the beam to Europe and received reports of 20 over S9. It was really a nice present. Friends from my home QTH told me that the XYL was listening to my transmitting frequency and that she was passing a lot of 68. When I went back, she told me she will apply for a license to be able to talk to me when I am away.

In fact, our group is planning other expeditions for next year, and you can bet they will be to some of the top-wanted DX countries. For the moment we do not intend to give more details; in these days it's very easy to hear people saying they are planning to go here and there, to listen for them next week from the moon, but nothing comes out of it! We will advise all DX bulletins a few weeks in advance, but only if everything will be 100% sure. But let's go back to Taiwan.

We did not work too much during the nights as the bands were dead and we had no authorization to operate on 40 and 80, but I spent some time listening and can give you assurance that it will be no problem to work BV from W6; even with the 12AVQ I was in the position to copy W6 on 40 and 80. It was evident that JA signals were well above S9 and VK/ZL on a 5 level.

The propagation from BV was not too good during our stay. We had only two good openings on 20 and three on 15. More or less the same situation for Europe, but with longer opportunities. In total we had 3329 contacts on SSB and 2050 on CW. 341 stations worked on 20 meters from US SSB, 317 on 15, 138 on 20 CW, and 201 on 15 CW. All this thanks to the beautiful job done by Tim and his group. Without their help and assistance, it would not have been possible to do anything.

Apart from the radio activity, we had the opportunity to visit Taiwan and spend some time with the local people. Taiwan is a 13,800-square-mile island with a subtropical climate situated 700 miles south of Japan and 100 miles from the mainland. The standard of living is very high and the number of cars, television sets, and air conditioners is unbelievable.

The philosophy of Chinese hospitality is based on what Confucius said 2500 years ago: "There is no pleasure to surpass the greeting of friends coming from afar." I can assure you that this is still valid. We had the opportunity to meet the local authorities, including directors of the Ministry of Communications and others, and had a wonderful party organized for us by the CRA.

It is difficult for me to express my feelings in a language that is not mine; it's difficult even in Italian! I can only repeat a few words Tim said to me when we left: "It is the end of a short adventure, my friend; it can be the start of a long friendship. Long life to you my friend."

Thank you, Tim!

de I2MQP

Left to right, I2MQP, BV2A/B, I2BVS, and I2NYN.

The party: I2MQP and I2BVS (standing) present an honorary membership on the DX Blue Team to Tim Chen BV2A/B. On the left of I2MQP is Mr. Pong, Deputy Director, Ministry of Telecom.

LIBERIA

Brother "Don" Donard Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
Monrovia
Republic of Liberia

Amateurs around the world are helping the lepers in Liberia. In the August, 1983, issue of *73*, the Liberia column gave in some detail the effort of the amateurs of Liberia to come to the help of the lepers at Ganta. The response to their "A8" special prefix (this is Echo-Lima-land) has been one-hundred-percent positive. Even beyond that, many of the amateurs volunteer the comment that they are happy some of their numbers are involved in a project that is so worthwhile.

At the date of this writing (11/23/83), the Ganta Leprosy Center has received a total of $2,243.02 from the contributions of amateurs in various parts of the world, and even as these funds were coming in, two of the mud huts in which the lepers are living literally collapsed. They are being rebuilt with the money received from the amateurs, and without that money there would probably have been no rebuilding at this time. There is another month of "Alpha 8 calling," and we hope that during this time we can do better.

Presently, the Center is directed by Dr. (Sister) M. Chambers, who is assisted by Theresa Hicks (a religious of another order). In the area of medicines, they are funded by the German Leprosy Relief Association and the government of Liberia. They have four hundred and forty patients. One hundred twenty of these patients are totally dependent, another one hundred twenty are ambulatory, and two hundred are outpatients (off campus).

There is a new medication in use in the form of Rifampicin capsules. With Dapsone daily and Rifampicin monthly, non-infectious leprosy can be cured in six months. Infectious leprosy can be cured in two years with Dapsone administered daily, Lamprene three times per week, and Rifampicin monthly. With the previous medicines, the cure took up to five years.

The immediate need at the Center is funding for new houses. Those presently in use are so dilapidated that large pieces of wall and or roof are breaking loose and falling down in rough weather. The mud in the walls has become washed out so that the walls are porous and house bugs and rodents. The remaining part of the story is not pleasant even to think about. In other areas, there is always need of bandaging, gauze dressings, medical adhesive tape, and cotton wool.

When the amateurs of Liberia began this project, they had visions of making sixty-thousand contacts, and with a small contribution from only a majority of these contacts, the houses could have been built. As it works out, it is evident that such a goal was a bit ambitious. On the other hand, a few of the amateurs contacted made sizeable contributions and a few others have taken upon themselves the job of doing a little fund-raising of their own and have then sent in the money. As a result, the total at this date is not unmeaningful.

Reports are now coming in from people who have received the Alpha 8 QSL card, and they are very pleased. The word is that the card is oversize, that it has pictures, and that it is very beautifully done. We, here in Monrovia, have not seen the card yet, but we are gratified to know that they are being received and that they are a bit more than the ordinary.

Should anyone wish to contact the Leprosy Control Center directly, address: Dr. Margaret Chambers, Ganta Leprosy Center, Box 1010, Monrovia, Liberia, West Africa.

For me, personally, this program has been a grand experience. Aside from the fact that we are helping the lepers, I have a new appreciation of amateur radio and its amateurs. The response from all over the world has been positive and courteous. I have received nothing but praise and good wishes. The greater the need or the greater the emergency, the more sure you can be that the amateurs will be there.

MONROVIA'S NEW REPEATER

Big news! The brand-new (second-hand and rebuilt) repeater is twenty Watts. With a good antenna location, it should cover the city of Monrovia and we, the local amateurs, should have HT communications over the greater part of the city!

That part is all true and it is fine, but what about the amateurs who do not live in greater Monrovia? The situation in Liberia is different from that in the States. In the States, there are many repeaters and amateur operators have a wide choice. They even have scanners. More important than that, they have other types of communications available. Here in Liberia, amateurs who find themselves in outlying areas are almost totally dependent on their radio.

Until now, there has been one repeater in operation. It is at Bong Mines, which is an excellent location. They have skilled technicians who maintain it and make changes when it is necessary. It covers most of Liberia, but when an amateur finds hmself 120 miles "up country," he has problems and cannot always make the repeater. For a very interesting story concerning this situation, read the Liberia column and the story of Mark H. Munson, M.D., EL5G, *73*, September, 1983.

Monrovia itself is about 65 miles from the Bong Mines repeater, so the little HT has a bit more than it can handle, and even home sets with their higher power and better antennas will not make the repeater unless everything is working well. The new Monrovia repeater will solve this

problem nicely. While we are solving our problem, we are, however, cutting out the amateurs outside.

Can our repeaters be made to talk to each other? The experts around here say "yes." In view of the fact that there will be only two repeaters in Liberia, they expect no interference and they think it can be done. No one has presented a feasible plan yet, although it must be added that until now the question has been quite remote.

Whatever happens it is evident that we will either find a way or go back to the one-repeater operation. We cannot cut out our amateur friends on the outside.

THE NETHERLANDS

Henk Meerman, Jr. PD0DDV
Zandvoorterweg 33
2111 GR Aerdenhout
The Netherlands

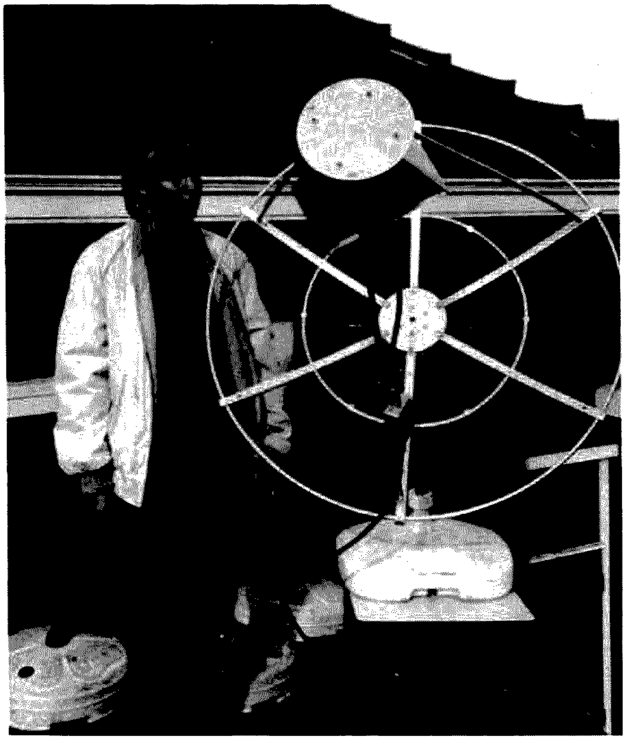
B.A.W. Aries PA3BWQ
Schuberthof 3
2742 BT Waddinxveen
Holland

Finally, after several weeks of postal and transport strikes over the whole country, I am able to write another column for *73*. Everybody is relieved that life has taken its normal way again. It was impossible to send a letter or a parcel to someone; also, the national finance was completely out of order.

Nevertheless, we had some extremely good conditions this season on VHF. Some hams worked as far away as Iceland on two meters with FM mode and simple beam antennas. Yours truly had to miss all of the fun because of a serious antenna breakdown.

Last year, the youngest of our three Dutch Radiosocieties, the NCV, celebrated 10 years of existence with a party for all members. There also was held an open day for the public, during which they were active with their club station, P14HLM, on HF, CW on all bands. A complete amateur TV station on 70 cm also was on the air, which made contact with a mobile ATV station.

The mobile unit made some stops to give some demonstrations to the public. Furthermore, they had an operational weather-satellite station receiving Meteosat 2 (1.6 GHz). A dish was placed on the roof of the club building with a converter from 1.6 GHz to 137 MHz. To get a satellite picture on a monitor, an FX-655 Vraase Fax memory unit was used.



PD0DDV's YL and the antenna used to receive Meteosat II.

SIX METERS IN HOLLAND

Although 50 MHz is not an amateur band in Holland, there are a few amateurs with a special license who operate on that band. They are allowed to do experimental transmissions on the following frequencies: 53.875 MHz, 53.925 MHz, and 53.975 MHz in CW only. The maximum power they use is 25 Watts. Many hams hope that this band will become a ham band in the future, although the license conditions are not very clear. There are some rumors that it will be assigned to the land mobile service, so let's keep our fingers crossed.

I'd like to end this column by writing about the Veron PACC (PA Century Club) Award. To earn this well-known Dutch award, you have to work at least 100 different Dutch amateur stations and have proof of it by means of a QSL card or another written confirmation. Only contacts made after the first of June, 1945, are valid for this award. There are stamps available for 200 to 900 different worked stations, so the certificate can be expanded in the future when you work more Dutch stations.

de PD0DDV

UIVER MEMORIAL AWARD

It is fifty years ago that the legendary London-Melbourne Race, organized by the Australian chocolate manufacturer McPherson Robertson was held. KLM Royal Dutch Airlines participated in that race with the then brand-new, all-metal, low-wing standard airliner Douglas DC-2 in a field of other aircraft mainly built for speed. This famous aircraft, named *Uiver* (stork), won the first prize in the handicap section and came in second in the speed section. Most remarkable was the fact that KLM conducted this flight as if it were a regular airline flight, carrying three paying passengers in all possible comfort and some 500 pounds of mail.

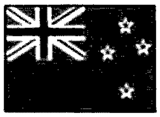
To commemorate this famous event, the Netherlands Broadcasting Corporation NOS conceived the idea to make a documentary of this flight which will be shown serially on television in October, 1984, the month in which the Melbourne Race took place 50 years ago. The idea was born to have this flight repeated, not with a modern Boeing 747 airliner, but with a Douglas DC-2. The apparently last airworthy DC-2 in the world was found in the United States, bearing registration NC39165 and owned by Colgate W. Darden.

The total costs for the entire *Uiver* project, including the film production, are tremendous, and in order to raise these costs, the *Uiver* Memorial Foundation was established. The funds for the commemoration flight were sought from major sponsors and the public.

The aircraft arrived at Schiphol and was given the new equipment necessary to conduct the flight in the modern aviation world. The aircraft carried exactly the same paint scheme, registration PH-AJU, name *Uiver*, and contest number 44 as the original aircraft. The flight schedule took this aircraft across a route from Amsterdam to Melbourne as close as possible to the route followed by the *Uiver* in 1934. That flight took 90 hours, 17 minutes, but the memorial flight lasted from December, 1983, until February, 1984.

Amongst Dutch radio amateurs, it was suggested that an award could be issued, and profits gained by the issuance of this award could be made available to the Foundation as a contribution of radio amateurs to this event.

de PA3BWQ

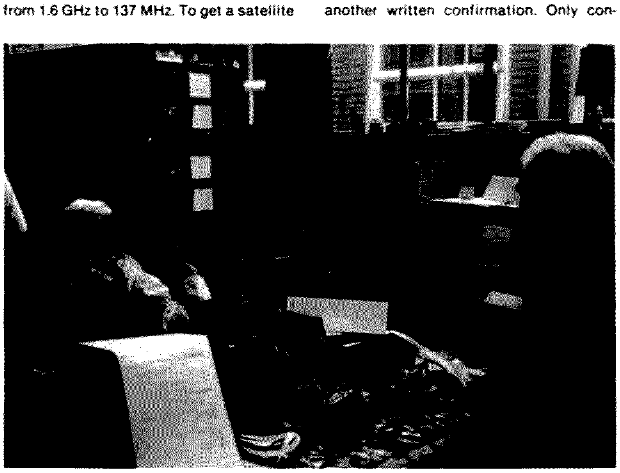


NEW ZEALAND

Des Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

ZL LICENSING STRUCTURE

There are three grades of amateur license plus a Novice (non-renewable) license available in New Zealand. The amateur-radio examination and licensing structure is under the control of the New Zealand Post Office, the radio regulatory body in ZL. The radio regulatory area is controlled by the Radio Branch of Post Office Headquarters and administered by



Inside the NCV club building.

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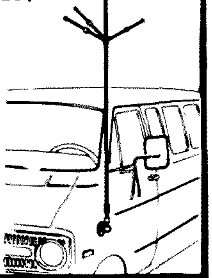

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Repeater Name	Repeater Output	Repeater Input
665	146.65	146.05
670	146.70	146.10
675	146.75	146.15
680	146.80	146.20
685	146.85	146.25
690	146.90	146.30
695	146.95	146.35
700	147.00	146.40
705	147.05	147.65
710	147.10	147.70
715	147.15	147.70
720	147.20	147.80
725	147.25	147.85
730	147.30	147.90
735	147.35	147.95

Simplex Name	Calling Frequency
6475	148.475
6525	146.525
6575	146.575
7425	147.425
7475	147.475
7525	147.525
7575	147.575

70 CM REPEATERS AND SIMPLEX FREQUENCIES

Repeater Name	Repeater Output	Repeater Input
850	438.50	433.50
855	438.55	433.55
860	438.60	433.60
865	438.65	433.65
870	438.70	433.70
875	438.75	433.75

Simplex Name	Frequency
330	433.30
335	433.35
340	433.40
345	433.45

the Radio Inspectors Branch in each of the 17 Post Office Engineering Districts throughout the country.

The Novice license is available for one year *only*. It cannot be renewed, only upgraded. The basic requirements to pass the Novice exam are:

- a simple written examination in elementary principles of electricity and radio communications,
- a written examination on the Radio Regulations as they pertain to the Amateur Service, and
- a Morse test, sending and receiving 6 words a minute of each for 3 minutes; the receiving test has to be written.

A full pass in all three sections above entitles the Novice (callsigns with the first suffix letter N, e.g., NAA, NAB, etc.) to operate CW and AM, including SSB, on the bands 3525-3575 kHz and 28.10-28.60 MHz, with the restricted power of 10 W input to the final stage.

The next level, the Grade III license, requires a written paper on the theory of electricity and radio communications as well as the paper on Radio Regulations, but no Morse test. The Grade III licensee may operate on all amateur bands above 51 MHz only, on all modes except CW. The callsign issued to a Grade III licensee has the first suffix letter a T or U, identifying him as a VHF operator.

To progress to Grade II, the Grade III operator needs only to pass a Morse test, both sending and receiving, at 12 wpm, each for 3 minutes, the receiving test to be written. A pass to Grade II brings the allocation of a full callsign, either a two-letter (if one is available) or a three-letter one, which the amateur will hold for life whilst licensed within ZL. Previously, ZL amateurs changed callsigns when they changed their residential address to another ZL District, e.g., 1, 2, 3, or 4. But since 1980, callsigns have been allotted on a life basis, and as long as the amateur pays the license fee, no matter where he resides, he retains the original call issued. The only requirement is to notify the regulatory body of any change of address.

The Grade II operator is entitled to operate on the bands 1800-1950 kHz, 3.5-3.9 MHz, 28-29 MHz, 50-51.15 MHz, and all bands above 51 MHz, on all modes, CW included on the VHF bands.

Grade I is the top grade of amateur license in ZL; to obtain this license, it is necessary for the Grade II operator to have operated on the 3.5-3.9-MHz band under a Grade II license for a period of 12 months and to have had more than 50 contacts on that band. In addition to the operating qualification, it is necessary to show, by a further Morse test, that he/she is still capable of sending and receiving 12 wpm under the same test conditions as before. Applicants satisfying these requirements are granted a Grade I Certificate which entitles them to operate all bands and all modes allocated to ZL amateurs.

The theory examinations are conducted by the New Zealand Post Office in various examination centers throughout the country, twice each year, on the first Wednesdays in March and September, between 1:30 pm and 4:30 pm. The Morse test can be arranged anytime during the year by making an appointment with the Radio Inspector's Office in your local area and paying the examination fee of $NZ6.00. The fee for the theory examinations are $NZ13.00.

VHF IN ZL-LAND

The VHF scene in ZL is very much alive. Amateurs are active in operating and experimentation on all bands, as can be seen from the ZL Amateur Radio Records Chart in the box. ZL amateurs are doing their thing with VHF/SHF experimentation; as can be seen from the Record Chart, ZLs hold at least three world records for three different frequencies. ZL VHFers are also active in satellite work, moonbounce, ATV, packet radio, etc., and many are members of AMSAT. I shall cover some of these special areas in another column.

Under the ZL licensing structure, there is a non-Morse license available as outlined previously in this column. These T calls, so-named after the first letter of the suffix of the original calls issued to non-Morse licensees, are able to operate the bands form 51 MHz upwards on all modes except CW. Approximately 33% of the ZL amateurs are T calls, and these, plus the VHF enthusiasts from Grade II and I operators, make the VHF fraternity quite large in comparison with the total amateur population in New Zealand.

The most popular of the VHF bands are 8m, 2m, and the fast-growing 70 cm; all the other VHF/SHF bands are attracting the VHF experimenters who are keen to see what can be built and operated on these higher bands. Six meters is, of course, the VHFer's DX band and has been made available only to the Grade III operators in recent years. Previously, they were confined to 2m upwards, but an amendment to the licensing structure a year or so ago enabled the Grade III licensee to use a small part of the 6m band also.

Two meters is very popular, there being a very efficient network of 2m repeaters throughout the country, giving excellent coverage for most areas. There are at present 30 repeaters in the North Island and 16 in the South Island, providing extensive coverage. The repeater offset is 600 kHz plus or minus, negative below 147 MHz and positive above 147.05 MHz. (See box for the 2m repeater and simplex frequencies.) ZL repeaters, unlike those in North America, do not have a CW identification or timers built into their installations.

70 cm is in its infancy in ZL. However, there are 6 repeaters in the North Island and 3 in the South, located mainly in the main metropolitan centers with a couple of exceptions. This frequency is becoming very popular where it is available and will spread further afield in due course (see box).

VHF beacons also are operated by the various clubs (Branches) throughout the country, ranging from three on 6m to two on 10.25 GHz and one on 24.20 GHz. In all, there are 32 VHF beacons, including one lonely 10m beacon on 28.230 MHz located at Upper Hutt, near Wellington.

Other VHF activities scattered through the year's program include VHF/SHF contests; 2m, 6m, and other specific frequency contests; VHF/SHF Field Days; VHF/SHF DX Weekends; and probably the highlight of the VHF year, the VHF Convention held on Easter weekend (in a different city each year, where VHF enthusiasts gather to "Nog and Nosh", dine and dance, socialize, attend technical lectures and demonstrations, participate in transmitter hunts (fox hunts) with various twists, e.g., blindfolded, pedestrian, talk-in, a Mobile Rally, various other social and VHF-associated activities, and, of course, the usual trade displays and the inevitable "Trading Tables." Last year's convention at Christchurch attracted VHFers from Cook Islands (ZK) in the North to Queenstown (ZL4) in the South.

This year's convention is at Auckland with the theme, "Space Communications"; it has a full program of technical lectures on the convention theme supported by working demonstrations and lectures on amateur satellite and moonbounce techniques, as well as the usual round of social activities.

BITS 'N' PIECES

More members of the ZL Old-Timers

AMATEUR RADIO RECORDS

March 1983

It is well known that amateur-radio operators can talk all over the world. However, there are amateur bands in the Very High Frequency (VHF) spectrum—above 30 MHz—which require special efforts to cover distances beyond the horizon. Also, the higher the frequency used, the more difficult communications become. The following are VHF records held by New Zealand amateur-radio operators. The callsign in parenthesis is the current callsign held, and /P indicates portable operation.

Band	Record	Stations	Date	Distance (km)
6 Meters (52-MHz band)	Overseas	ZL3NE to VE1AVX (Canada)	11/16/80	15,555
2 Meters (144-MHz band)	Internal	ZL2ARW/P to ZL1BJP/P	2/3/82	1,069
2 Meters (144-MHz band)	Overseas	ZL2HP to VK5BC (Australia)	12/23/65	3,195
2 Meters (144-MHz band)	Moonbounce	ZL1AZR (ZL2AZS) to SM7BAE (Sweden)	3/4/69	18,298 (World Record)
70 cm (432-MHz band)	Internal	ZL2ARW/P to ZL1BJP/P	2/3/82	1,069
70 cm (432-MHz band)	Overseas	ZL2TGZ to VK2RU (Australia)	2/8/82	2,480
70 cm (432-MHz band)	Moonbounce	ZL3AAD to DL9KR (West Germany)	3/23/80	18,630.9 (World Record)
70 cm (432-MHz band)	Television	ZL2TWS/P to ZL2ASF/P	1/31/82	373.1
23 cm (1296-MHz band)	Internal	ZL1THG/P to ZL2ARW/P	1/30/82	687
23 cm (1296-MHz band)	Overseas	ZL1AVZ to VK2BDN (Australia)	2/9/82	2,131
12.5 cm (2300-MHz band)	Internal	ZL1THG/P to ZL2ARW/P	1/31/82	687
9 cm (3300-MHz band)	Internal	ZL2AQE/P to ZL2ARW/P	3/6/83	547 (World Record)
5 cm (5800-MHz band)	Internal	ZL2AQE/P to ZL2ARW/P	1/29/83	225
3 cm (10,000-MHz band)	Internal	ZL1THG/P to ZL2BFC/P	1/25/81	390
1.25 cm (24,000-MHz band)	Internal	ZL2ARW/P to ZL2TRV/P	12/8/79	18.5

The VHF records are administered on behalf of NZART (Inc.) by H. N. Wiggins ZL2BFR. All claims must be made in writing to PO Box 1718, Palmerston North, giving frequencies, date, callsigns used, locations of both stations, and confirmed distance.

The antennas and residence of LA3XI. His QTH is one of the best in Norway, high up on a hill.

Svein Ovenstad LA3XI and his dog.

Club have reached the mark where they qualify for 50-year certificates—congratulations to them all. They are ZLs Bill Forbes 2OW, Bob Wright 2FX, Jim Fish 1GF, Dave Shepherd 2KD, Jack Crickett 1DY, Jock White 2GX, Bob Glassey 2ACG, C.H.R. Crawford 2JV, Dick Tout 2PO, Roy Yorke 1WY, and Dave Masterton 4LF.

Silent Keys of recent months were Norman Walding ZL2GZ, September, 1983, Peter Rothschild ZL2TY, October, 1983, Ted Pratt ZL1FY, March, 1983, and Jack Parminter ex-ZL2OU, aged 83 (who relinquished his call two years ago after holding it since 1935), in September, 1983.

NORWAY

Bjorn-Hugo Ark LA5YJ
N-3120 Andebu
Norway

As promised in earlier columns, a presentation of Norwegian DXers was bound to come, and here is the first one. I am proud to present to you my good friend Svein Ovenstad LA3XI from Lierskogen, 40 km south of Oslo on the western side of the Oslo fiord. He's forty years old, married with two more-or-less grown kids. He got his license in 1962, got the taste of DXing in 1963-64, and has ever since been totally devoted to that part of the hobby.

Around 1967-68, he was tearing up the 80-meter phone band with his tremendous signal from a rhombic stretched around his property. At that time, the activity on 80-meter DXing was rather low all over the world. Only a few had discovered the wonderful DX openings occurring on 80 meters. So his efforts really paid off. You still may hear him on the lower bands, but only occasionally, even though he does a good deal of listening. But I can assure you that if a rare one comes up, he'll be there.

Mostly you will find him scanning the 20-, 15-, and 10-meter bands very thoroughly, and if a new one is expected, he'll be nailed to that chair till he works him. This is quite understandable since he has put so much effort into reaching the DXCC Honor Roll. His standing as of November 15th was: phone 318, mixed 320, and CW 280.

He surely made it happen himself. Daily work is with an aircraft company, the Braathen SAFE airlines, as a Senior Engineer. Beside his DXing and work, he is a passionate hunter, and he and his dog are really making it quite unsafe for wildlife during the hunting season up in the mountains.

One of the most interesting parts of the story about LA3XI has to do with the kind of gear he is running. Here it is: a Drake TR-7 with RV-7 remote vfo, MN-2700 tuner, a home-brew linear giving the legal power of 800 Watts input, and a Hy-Gain TH6DXX (it used to be a 20-meter, 6-element monobander with a 17-meter boom) with a tower height of 21 meters. On the lower band, he is now just running a 40-meter sloper which he, with his Drake tuner, manages to run with a fairly good result on the other bands.

Svein has, in many years, together with LA8CJ and the late LA1KI, been the major source of first-hand DX information, always double-checking any rumors and passing the word rapidly around to all others. Earlier last year he was elected president of the LA-DX group, and he really deserved to be the first choice to hold the seat after our dear LA1KI.

In Norway, there is very little news to tell right now, but everything seems to point towards a good season for low-band DXing. W6s and W7s are starting to come through as usual at this time of the year, over the long path. And the cold and snow have come as well. Storms are breaking over the country, and the hams are very busy getting the last antennas up, so everything is just normal.

Speaking of antennas, I've been trying to get a good one up for 80 meters, but the bobtail curtain doesn't really seem to be the right one on my property. So we're trying to finish getting up that 5/8 vertical again and have already found out that a full-size, two-element quad just happens to be a little bit too large for the property, since the terrain is sloping on one side (and, of course, the house is a little too hard to move). Now the planning machine is really running at full speed again—for a mini-quad, two-element delta-quad at this moment!

I'm really wondering what I'm gonna settle with. Time is critical; winter is coming, and since I have only the weekends available (with my father celebrating his 70-year birthday and the CQ WW contest both on the same weekend), I'm getting just a little tense.

I have learned through the years and from my own experiences that I'm absolutely not the only one suffering from that kind of nuisance, and since I have managed the previous seasons, I probably will make it this time as well!

Have a good time, and work lotsa good DX, will you?

POLAND

Jerzy Szymczak
78-200 Bialogard
Buczka 2/3
Poland

NEWS FROM POLAND

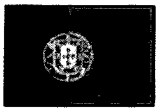
The most important event organized by PRAA (Polish Radio Amateurs Association) in June, 1983, was the Telegraphy Championship of Poland. The Championship took place on June 11th and 12th in the Youth Palace in Cracow. Seventeen competitors entered the contest. Jozef Czystowski SP3JHT, before Adam Sucheta SP9DH, won the quality competition (reception and transmission). Jozef Czystowski, before Andrzej Sikorek SP7OU, won the reception speed competition, but Adam Sucheta was better than Jozef Czystowski in the transmission speed competition. Jozef Czystowski gained an advantage over Adam Sucheta in the general classification. Among juniors, Jacek Szaro SP-0022/KS was the best. The Gorzow Wielkopolski Section of PRAA won the first place among all teams taking part in the Championship.

Constant activity sponsored by the Headquarters of PRAA, not only in the organization of competitions, makes for the revival of radio clubs in Poland, but not without problems. Some time ago a free hand at promoting new clubs was given, and this seemed to stimulate the work of hams. Some new little clubs that tried to paddle their own canoes were born in recent years, but not always did they get along with each other. First and foremost, lack of equipment did not allow them to pack on all sail. Furthermore, as a result of the suspension of PRAA in December, 1981, ties of friendship between one radio amateur and another were broken.

To meet the needs, the Headquarters of PRAA invited entries for a contest of radio amateurs' output. The contest is intended to promote the designing of new shortwave rigs, measuring devices, and auxiliary apparatus. Best designs are to be publicized and manufactured by Poles residing abroad. The contest started September 1, 1983, and ends March 31, 1984. On March 31st, the jury opens entries and generally evaluates the documentation furnished. Then at a second stage of the contest entries are more carefully screened. Decisions on results are made at an exposition of all the best entries picked at the second stage. The final judgment is based on:

- parameters of device,
- modernity and originality of solution,
- use of homemade sub-assemblies,
- practicability, and the
- clarity of documentation.

The Technical Commission of PRAA looks forward to the results of the contest. New solutions to equipment problems suitable for publication in magazines and books would be its fruit. The Technical Commission hopes that some of the innovations will be carried to production. This would improve supplies for hams in Poland. There are quite a few designers of shortwave equipment in my country, and the contest is raising new hope of more and better equipment.



PORTUGAL

Luiz Miguel de Sousa CT4UE
PO Box 32
S. Joao do Estoril
2765 Portugal

Here we are once again to give you news about ham activity in this country.

In my previous column, I wrote about reciprocal agreements that we have with several countries in Europe, Africa, and North and South America. However, on November 11, 1983, an important meeting was held in Lisbon with the Spanish and Portuguese governments, and a reciprocal agreement was signed on that date with this neighbor country.

When requesting a ham license under reciprocity, you have to send the following information with the petition: name, call, date of birth, nationality, place of birth, father's name, mother's name, profession, place staying in Portugal, number of present license, validity, passport number, place of issue, validity of the passport, and dates of operation in Portugal.

Always remember that under the reciprocity rules only 30 days are authorized, and a car registration number is necessary if a mobile station is used. Please address all this to REP (IARU member), Rede dos Emissores Portugueses, Rua D. Pedro V, #7-4, 1200 Lisboa, Portugal, and include US$30 for expenses. Finally, do not forget a Xerox® of your present ham license and passport.

NEW REGULATIONS

During the WCY we celebrated in 1983, Portuguese hams had the opportunity to receive the new Regulations for the Amateur Service, in force since July 21, 1983, and issued by the Ministry of Communications. Its contents are so controversial we easily find out that it does not have all the elementary basics of good regulations; this certainly is due to a lack of knowledge of the amateur-radio hobby. For examples:

- The output power attributed to the different classes is incompatible with the equipment and components available today.
- RFI and TVI—this chapter is a bit confused and hard to understand. According to the rules, the ham has the highest responsibility and is charged with finding solutions, including payment for devices to be connected in receiving equipment. We do not have any government institution supervising the production or the manufacturing of electronic or electric apparatus. This means that high-pass filters or other such devices are seldom used in such equipment.
- We are not allowed to use all the classes of emission for the Amateur Service, and permission to use J8E type seems strange.
- The subdivision and use of the allocated frequencies does not comply with the IARU Region 1 band plan (HF), which is practical in the countries of that region.
- It is inexplicable that hams with higher class licenses cannot operate frequencies allocated to lower classes, which we could used before. Superior classes have had a loss of privileges.

According to the new rules, we have four different classes:

Class A (the highest) hams are allowed to operate amateur-radio stations with a maximum output power of 600 Watts in every Amateur-Service band.

Class B operators—same as above, with no more than 300 Watts output.

Class C operators are allowed to use stations with maximum output power of 150 Watts with some limitations concerning frequencies and emission types.

Class D—same as above, with no more than 60 Watts.

However, the critical point of this regulation is the fact that a ham having an A or B class license cannot use frequencies and emission types where the other classes can, as follows:

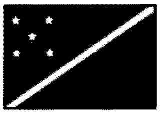
- on 40 meters—A and B: 7.000 to 7.100 kHz, A1A, F1A; 7.050 to 7.100 kHz, A3E, C3F, while D class: 7.000 to 7.050 kHz, A1A, F1A, A3E.
- On 10 meters—A or B: 28.200 to 29.700 kHz, A1A, A3E, C3F, F3E, F3F, while C class: 28.200 to 29.700 kHz, A1A, A3E, F3E, F3F, and D class: 28.00 to 28.100 kHz, A1A, F1A, and 29.000 to 29.100 kHz, A3E, F3E.

NEW BANDS AND 160 METERS

Many times we asked for the use of the new bands and also 160m but we were not lucky, then suddenly the good news came. (As they say, better late than never.) So as of November 4, 1983, Portuguese hams are allowed to work the new bands, as well as 160m on a secondary basis, according to the following: 1.830 to 1.850 kHz, 10.100 to 10.150 kHz, 18.068 to 18.168 kHz, 24.890 to 24.990 kHz.

Maximum output power for any of these bands is 60 Watts, and microphones must be kept out of the rigs, that is, CW *only*.

Best 73 from Portugal.



SOLOMON ISLANDS

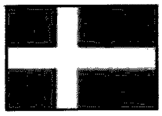
Solomon Islands Radio Society
PO Box 81
Honiara
Solomon Islands

A postage stamp featuring amateur radio has been issued by Solomon Islands as part of their World Communications Year set released on December 19, 1983.

The stamp, featuring the Solomon Islands Radio Society amateur station, callsign H44SI, is available on a special commemorative cover. The price of the cover is US$1.00, 5 IRCs, or equivalent, including postage.

The complete World Communications Year set of three covers featuring a total of 6 stamps is also available at a cost of US$6.00 or equivalent, including postage.

All orders should be forwarded to the Solomon Islands Radio Society, address above.



SWEDEN

THE SWEDISH DX FEDERATION

The Swedish DX Federation is the national umbrella organization for Swedish DXers and DX clubs. It was originally established in 1956 and reorganized in 1969. It has more than 1800 individual members and some 40 local DX clubs.

The Federation publishes a monthly offset-printed magazine in Swedish, *Eter-Aktuellt*. Through "DX-Kop," Swedish DXers can buy report forms, books, receivers, etc. The Swedish DX Federation produces regular DX programs, broadcast via the Voice of the Andes (Ecuador) and Deutschlandfunk (Federal Republic of Germany).

Member clubs are supported by the DX Federation in different ways. Examples of these activities are: supplying pamphlets about DXing, producing tape recordings and slides to be used at club meetings, completing material for a DX course for beginners, etc.

The annual meeting of the Swedish DX Federation, the DX Parliament, will be part of EDXC 84 (the European DX Council 1984 conference, in Stockholm, June 8-11, 1984). At the DX Parliament, the members of the board of directors are elected and decisions are made concerning future activities of the Federation. This part of the conference will be held in Swedish, while the rest of EDXC 84 will be in English.

We of the Swedish DX Federation are very pleased for this opportunity to work together with Radio Sweden International in arranging the 1984 EDXC conference. During the 1970s, participation in the DX Parliaments declined. One reason for this has been that many foreign DXers and station representatives have chosen instead to participate in the EDXC conferences. To some degree, the EDXC conferences have "competed" with our DX Parliaments. This is one reason why we are very happy to be able to hold the 28th DX Parliament as part of the 18th EDXC conference. We hope to combine the enjoyable atmosphere of past DX Parliaments with the somewhat larger EDXC conference.

Welcome to Stockholm June 8-11, 1984!

AWARDS

DAYTON HAMVENTION ADDS NEW AWARD

The Dayton Hamvention is adding another award this year. The award will be given for technical excellence. It will go to an individual making a significant contribution to amateur radio in the technical field.

The coveted Amateur of the Year and Special Achievement awards have long been a fixture of the Hamvention. The award for technical excellence will round out the awards by recognizing those keeping amateur radio at the forefront of the state of the art and fostering interest in technical achievement.

Anyone wishing to nominate a candidate for any of the awards should do so by writing to: Awards Committee, Dayton Hamvention, Box 44, Dayton OH 45401. The nomination(s) should provide as much information as possible about the individual(s), emphasizing the accomplishments justifying the award(s). The closing date for nominations is April 1, 1984.

DEALER DIRECTORY

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	14	14	14A	14A
ARGENTINA	21	14	7A	7B	7B	7	14	21A	21A	21A	21A	21
AUSTRALIA	21A	14	7B	7B	7B	7B	7B	14B	14	14	21	21A
CANAL ZONE	14A	14	7	7	7	7	14A	21	21A	21A	21A	21
ENGLAND	7	7	7	3A	7	7B	14	14A	21A	21	14	14B
HAWAII	21	14	7B	7B	7	7	7	7B	14	21	21A	21A
INDIA	7	7B	7B	7B	7B	7B	14	14A	14	14B	14B	7B
JAPAN	14	14B	7B	7B	7B	7	7	7B	7B	7B	14B	14A
MEXICO	21	14	7	7	7	7	7	14	21	21A	21A	21
PHILIPPINES	14	14B	7B	7B	7B	7B	7B	14B	14B	14	14	14
PUERTO RICO	21	14	7	7	7	7	14	14A	21A	21A	21	21
SOUTH AFRICA	14	14	7	7	7B	14	21	21A	21A	21A	21	14A
U.S.S.R.	7	7	7	3A	7	7B	14	21	21A	14	7B	7B
WEST COAST	21A	14	7	7	7	7	7	14	21	21A	21A	21A

CENTRAL UNITED STATES TO:

ALASKA	14A	14	14	7	7	7	7	7	14	14	14A	21
ARGENTINA	21	14	7A	7B	7B	7	14	21A	21A	21A	21A	21
AUSTRALIA	21A	21	14B	7B	7B	7B	7B	7B	14	14	21	21A
CANAL ZONE	21	14	7	7	7	7	7A	14A	21A	21A	21A	21
ENGLAND	7B	7	7	3A	7	7B	7B	14	14A	21	14	14B
HAWAII	21A	14A	7A	7	7	7	7	7	14	21	21A	21A
INDIA	7B	14B	7B	7B	7B	7B	7B	14B	14	14B	14B	7B
JAPAN	14A	14	14B	7B	7B	7	7	7	7B	7B	14B	14A
MEXICO	14A	14	7	7	7	7	7	14	14A	21	21A	21
PHILIPPINES	14A	14	14B	7B	7B	7B	7B	7	14	14	14	14
PUERTO RICO	21	14	7	7	7	7	7A	14A	21A	21A	21	21
SOUTH AFRICA	14	14	7	7	7B	7B	14	21	21A	21A	21	14A
U.S.S.R.	7B	7	7	3A	7	7B	7B	14	14A	14	7B	7B

WESTERN UNITED STATES TO:

ALASKA	14A	14	14	7	7	7	7	7	14	14	14	14A
ARGENTINA	21	14A	7A	7B	7B	7	7B	14A	21A	21A	21A	21
AUSTRALIA	21A	21A	14A	14	14B	7B	7B	7B	14	14	21	21A
CANAL ZONE	21	14	7	7	7	7	7	14	21A	21A	21A	21
ENGLAND	7B	7	7	3A	7	7B	7B	7B	14	21	14	14B
HAWAII	21A	21	14A	7A	7	7	7	7	14	21	21A	21A
INDIA	14B	14A	14	7B	7B	7B	7B	7B	14B	14B	14B	7B
JAPAN	21A	14A	14	14B	7	7	7	7	7	7B	14	21A
MEXICO	21A	14A	14	7	7	7	7	7A	14A	21	21A	21A
PHILIPPINES	21A	14A	14	14B	7B	7B	7B	7	14	14	14	21
PUERTO RICO	21	14	7	7	7	7	7	14	21A	21A	21A	21
SOUTH AFRICA	14	14	7	7	7B	7B	7B	14	14A	21A	21	14A
U.S.S.R.	7B	7B	7	3A	7	7B	7B	14B	14	14	7B	7B
EAST COAST	21A	14	7	7	7	7	7	14	21	21A	21A	21A

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

MARCH

SUN	MON	TUE	WED	THU	FRI	SAT
				1 F/G	2 G/G	3 F/G
4 F/G	5 F/G	6 G/G	7 G/G	8 G/G	9 G/G	10 F/F
11 P/P	12 P/P	13 F/G	14 F/G	15 F/G	16 F/F	17 P/P
18 P/F	19 P/P	20 P/P	21 P/F	22 G/G	23 G/G	24 F/F
25 F/F	26 F/F	27 F/F	28 F/G	29 F/G	30 F/G	31 F/F

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T.M.

International Edition

April 1984 $2.50
Issue #283

Amateur Radio's Technical Journal

A Wayne Green Publication

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Masada!
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Microwave Yourself
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Mobile Whiplashes
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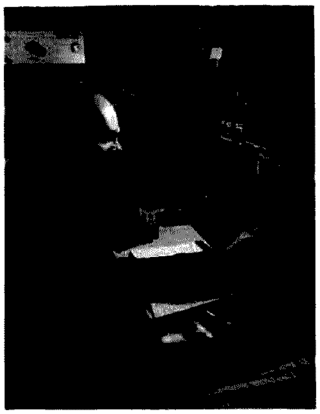
04
74470 65946

Dayton Doings—10

Sun Fun—100

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green



THE SONY SURPRISE

A couple of years ago, Sony brought out their 2001 all-band digitally-controlled receiver. It wasn't terribly sensitive, but it would tune in CW and sideband and the price was, particularly for Sony, most reasonable. This was followed by their 7600 shortwave receiver—truly a marvel of compactness, small and light enough for the jacket pocket. It also had amazing bandspread for the most popular shortwave broadcasting bands—and a surprisingly low price.

This was followed a year later by the 7600A model, with a couple more bands. I liked this one particularly because it covered 40m and the CHU time signals, a nicety skipped in the first model. I took this radio with me on all of my foreign trips so I could check the VOA newscasts and make tapes of local AM/FM and SW stations in unusual spots around Asia and the Middle East.

Then last year Sony did it. They put the digital tuning system from the 2001 into the 7600, calling it the 7600D, (digital, I presume). Wowie! Again, as with the 2001, the sensitivity is about on a par with Don Rickles, but it tunes from 150 kHz to 30 MHz, plus the FM band! It has a bfo and a vernier on the tuning so you can tune in sideband just fine. It also has ten buttons you can program for instant frequency selection. I find that handy for WWV/CHU time and my favorite FM stations. Yes, it has an automatic scanner, too.

It's possible that some of the ham dealers carry this radio. You might want to check around. If you travel much, this can be a real prize. I love checking the 20m and 15m bands from different places around the world as I travel.

I've been looking for a ham to join my staff who might, in addition to testing new ham gear in the W2NSD/1 ham shack for reviews in *73*, arrange with Sony and other such manufacturers to make non-ham products such as this available via our magazines. Every now and then I find a toy like this which I think might interest readers but which could be hard to find for most people.

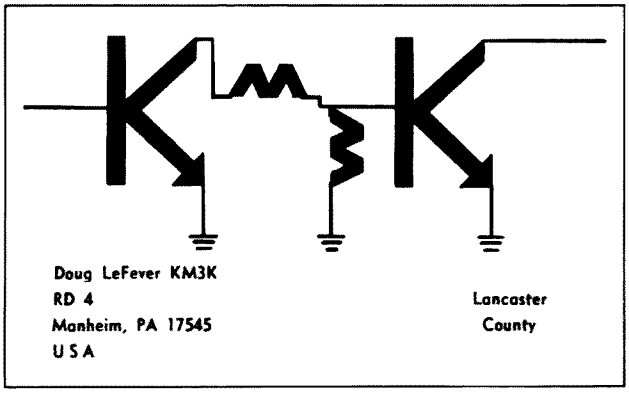
I'm one of those people who rush out and buy almost anything new. I almost always have a few surprising toys in my shoulder bag when I travel. It might be a radio, a miniature TV, a new kind of digital watch, or a new briefcase computer. Some people are just now discovering the Walkman. . . I had one of those within hours of its reaching this country eight years ago.

A lot of these gadgets you see in the mail-order catalogs are dogs, despite the glowing copy and gorgeous pictures. I pore over each new Sharper Image, Markline, JS&A, and so on catalog that arrives. Yep, I've tried the hanging by the feet gadget.

For instance, take the new tiny TV sets. Great technical marvels, no question about it, but who needs a Walkman TV? On most of the TV shows these days, you can turn off the picture and lose little, so if you're an addict, why not just get a miniature radio with the TV sound channels? I doubt that we are going to see many people walking around the streets with portable TVs on their hands.

Clive Sinclair has invested an enormous amount of time and money developing a very small portable TV. But for whom? I suspect that it was more the challenge of making it than any serious market expectations which drove Clive. I'll be watching the success of the Sony Watchman and the new Casio

Continued on page 146



QSL OF THE MONTH

To enter your QSL, put it in an envelope along with your choice of a book from *73*'s Radio Bookshop and mail it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not in envelopes or without a book choice will not be accepted.

John Wood WA4BPI
1101 Little Elton Lane
West Memphis AR 72301

Doing It at Dayton

This unofficial Hamvention handbook helps attendees and dreamers alike.

Change may be a hallmark of a democratic society, but it is also the byword of the 1984 Dayton Hamvention, whose leaders have made major modifications to the annual April event.

The location is the same, Dayton's Hara Arena, and the dates for the 1984 event are in their traditional location: the last full weekend of April (27, 28, and 29, for 1984), but there have been considerable changes made in other areas, primarily the flea market. According to the cochairman of the Hamvention, Harold "Hal" Judd WA8KNM, the changes should be "99 percent to everyone's benefit."

Topping the list of changes for 1984 are the set-up times for the flea-market vendors who have waited long hours in line in the past to get a space. This year, those holding flea-market permits, which can be secured *only* by ordering in advance, will be allowed to set up as early as Wednesday or Thursday in an assigned, numbered space. The spaces will be assigned on a first-come, first-served basis, meaning those who request a flea-market space and include the appropriate money with the request ($15.00 per space, four-space maximum) will be assigned a space first. Hamvention Flea-Market Chairman, John Grody WB8TEK, hopes this will eliminate the imposing practice of vendors waiting in line, sometimes as long as three and four days, to get what some consider prime flea-market real estate on the Hara Arena parking lot.

The official times for setting up in the flea market (for those with advanced sale permits *only*) will be Wednesday, April 25, noon until 5:30 pm local time, and Thursday, 8:00 am through the time the flea market opens to the public at noon on Friday. No sales will be permitted in the flea market prior to noon Friday when the gates will be opened officially to an anticipated crowd of over 20,000. Flea-market vendors also are reminded that a general-admission ticket is required for admission to the flea market in addition to your flea-market permit, so be sure to order it when you request your flea-market permit.

Since flea-market spaces are available only by advanced sales, the wisdom of ordering early is obvious. Ordering your general-admission ticket early would also be wise since the price has been increased to $7.50 in advance and $10.00 at the door. No doubt about it this year—the early bird gets the worm, the best flea-market space, and gets to save $2.50 on his ticket.

For those who were there last year, you'll notice that the opening time for the flea market has been shifted

Hams show up in droves when April comes to Dayton. Here's just part of the typical crowd that overflows the Hara Arena each year.

You'll find anything and everything electronic at the Dayton Hamvention, even a ham who has brought his own street light.

The Silver Arena section of the Hara Arena is just one of three large areas devoted to dealers and manufacturers' representatives.

In between flea-market expeditions, vistors to the Hamvention might make a side trip to Wright-Patterson Field, home of the US Air Force Museum.

from Saturday morning (as in 1983) to noon on Friday (as it was in 1982). This means that sellers will have two and one-half days to display their wares, and it also improves their odds of getting dry weather, a must element for outdoor display of radios and other moisture-sensitive electronic equipment.

To order flea-market spaces, send $15.00 per space (maximum of four per customer) to the Dayton Hamvention, PO Box 2205, Dayton OH 45401. Grody said that no flea-market spaces will be assigned until after January, but that requests which have come in will be given spaces in order of their arrival.

For anyone needing more information, Grody and his committee have made yet another change by setting up a flea-market information hotline at (513)-223-0923; this will be answered between the hours of 8:00 am and 10:00 pm EST beginning well in advance of the Hamvention.

More Changes

The changes in Hamvention '84 don't stop with the flea market. The Hara Arena has been expanded since Hamvention '83 and now has an additional 10,000 square feet located near the Silver Arena. The new space will be used in 1984 for the many Hamvention forums, while the space previously occupied by the forums has been made available to indoor sellers. Cochairman Judd believes that between 200 and 225 exhibitors will be displaying their wares inside the arena this year, and that includes the dealers and the manufacturers' representatives from such well-known companies as Trio-Kenwood, Icom, Yaesu, Hy-Gain, Drake, and Cushcraft.

With the expanded number of indoor exhibitors and the expected 1,500 flea-market vendors, there's going to be a lot for the Hamvention attendee to peruse in a short, two-and-one-half-day tour. But never fear, there is a way to do it, and the key is planning. Plan to get an early start each day, and plan each day as carefully as possible.

As soon as you enter the indoor part of the Hamvention the first time, you will be given a plastic bag which will contain the Hamvention program. This is your key to the entire event and it is worthy of a few minutes of study. Flip through the program, find the pages allocated to overall and interior maps of the exhibit area, and orient yourself. Next, check the times of the forums and note the ones you might be interested in attending. Try to work your tour around these times because the forums come only once while the flea market and indoor exhibitors will be there for the duration. This is one way to guarantee that you won't miss anything and be forced to go home with some heavy regrets.

You might also try to plan to have some energy left after a full day of hamfesting on Saturday to attend that evening's banquet This year's banquet speaker will be Harry Dannals W2HD, past president of the Amateur Radio Relay League.

Cochairman Judd added that there have been some changes made to the banquet, not in the ticket prices—which remain $14.00 in advance and $16.00 at the door—but in the menu. Judd said that the main course this year will be filet mignon. If you've ever intended to attend the banquet, this might just be the year to do it.

CHECKLIST FOR YOUR DAYTON TRIP

- Secure room reservations early, for the nights of April 27 and 28, and if you intend to arrive early on Thursday, for April 26.
- Purchase Hamvention tickets in advance and, if applicable, flea-market-space permits.
- Have the members of your group committed to attend the Hamvention and determine your transportation requirements.
- Save enough money to cover the cost of the trip and to cover the cost of any planned purchases. Turn most of your cash into traveler's checks as these are readily accepted at the Hamvention and at the flea market. Personal checks are NOT a readily-accepted method of payment. If a dealer has a choice of a cash sale or taking a risk by accepting a personal check, he'll probably take the cash.
- Pack clothing necessary for your three- or four-day trip. Don't forget, the weather is very changeable.
- Arrange for time off from work if you're part of the laboring class.
- Make and carry a list of things you intend to purchase at the Hamvention. The abundance of equipment found at the Dayton flea market is mind-boggling and could make you forget what you came there to buy.

Necessities

Hamvention veterans are well aware of what to bring to the event and how to dress, but for the sake of the newcomer, let me review some of the time-tested practices. If you plan to drive to Dayton in a private car from 500 miles away, as our group does, set aside at least $100 for gasoline, weekend accommodations, and food. Motel reservations should be made as early as possible and the Hamvention Housing Bureau can be a big help. You would be wise to take advantage of the service this Bureau offers. In the past, food has been plentiful and tasty at the Hamvention and, I might add, reasonably priced. The same is true for most of the restaurants in and around Dayton, so if you have the money set aside for eating, you will not starve. Just make sure you budget properly.

Let me suggest that you dress for the Dayton weather—and that means bring one of everything. I've seen years where the weather has been exceptionally beautiful—70 degrees plus during the days and no cooler than 40 degrees at night—while I've also seen the worst—constant rain and near-freezing temperatures during the days and nights. So dress according to the old outdoorsman's adage, in layers so that you can take off or put on as the weather changes. And make the final layer a waterproof garment while keeping the heavy coat within reach should the temps fall to an extreme. It can happen. The weather can be great or lousy and it can be a determining factor in how good a time you have at the Hamvention, so go prepared. The weather was great in 1982 with the only problem being chapped lips, while last year's weather was fit only for the ducks and the well-prepared.

To keep up with the members of your group, I would suggest that you rely on the ever-popular two-meter handie-talkie, but try to have everyone bring a synthesized rig so that you can be flexible in finding a standby frequency. A crowd of over 20,000 hams can generate a lot of rf.

GENERAL INFORMATION

Send ticket orders to:
Dayton Hamvention
PO Box 2205
Dayton OH 45401

Flea-Market Hotline
(513)-223-0923
(Try to limit calls to between 8 am and 10 pm EST.)

Inside Exhibits Information
(513)-236-6160

Prices: Registration general admission ticket is $7.50 in advance and $10.00 at the door. Tickets on sale in advance by mail or at the arena during the regular Hamvention hours; *not available over night as in the past.*

Hamvention General Chairman
Jack Mitchell AA8Q
Asst. General Chairman
Harold "Hal" Judd WA8KNM
Flea-Market Chairman
John Grody WB8TEK
Advance Registration
Marge Mitchell WD8DSN

April 28 Banquet Speaker: Harry Dannals, Past President, the Amateur Radio Relay League. Banquet tickets—$14.00 in advance, $16.00 at the door.

Flea-Market Setup Times
Wednesday, April 25: Noon to 5:30 pm. Thursday, April 26: From 8 am, all night, through to Friday at noon when the flea market opens to general public. *All flea-market permits will be sold in advance this year. None sold during the Hamvention. Flea-market vendors must have registration tickets and flea-market permits to be admitted to the flea market during setup times.*

Flea-Market Selling Times
Friday: noon to 6 pm.
Saturday: 6 am to 5 pm.
Sunday: 6 am to prize drawing.

Finances

Don't say it; I know what you're thinking. Here I've told you about all of the great changes for the granddaddy of all hamfests, but I haven't said how you can afford to go.

First things first. Talk to your buddies on the local repeater about a possible trip and find out who would like to go, and then get a concrete commitment from them so that you can plan properly. Then have each person arrange to have the days off from work that they'll need to make the trip. Setting aside Thursday for travel and Friday morning for setting up in the flea market may work, but if you're traveling far and plan to be in Dayton for the prize drawing Sunday afternoon, you might also consider taking the following Monday off from work to convalesce. You'll enjoy the trip more if you know that you don't have to go right back to work as soon as you get home.

Enough planning. Let's get down to paying for the trip. Overtime and part-time jobs are possible sources of extra revenue, but since it's a ham-radio activity, it seems appropriate to me that ham radio should help meet the expenses. That's where all of this talk about the flea market comes in. At a cost of $15.00 a space, three people can split the expense (investment?) and sell a lot of their unused equipment. Agreed, it's a common ploy at a hamfest, but I'm talking about Dayton, and that means you'll have probably 20,000 to 25,000 radio enthusiasts checking out your high-quality castoffs. As my Daddy used to say, "With that many fish, you're bound to get a bite." And with the three or four of you taking shifts at watching over the gear, you'll get a chance to check out everybody else's offerings and still not miss a sale.

Buying Gear

I always tell myself that if I sell one particular piece of equipment, then I'll use the money made on the deal to buy that new rig I've had my eye on. Besides being a great place to sell used equipment, Dayton is also the perfect place to buy that new rig since the dealers are always in a mood to sell at a good price. Call it their annual low-price fling or whatever you want, but I have always found what I was looking for at Dayton and found it at the best price. Ask anyone who's been there and I bet they'll tell you the same thing. You'll get to see what you want to see, put your hands on it, push the buttons and turn the knobs, and then buy for the best price imaginable.

I know the dealers will probably skin me alive for saying this, but let me pass along a word of advice—spot the piece of gear you want at three or four dealers, list the prices, and then go back to each one and ask them to give you their rock-bottom, last-day-of-the-hamfest price. If you think one of them is offering you the best deal you'll see, make your purchase from

that dealer. If you think you can get it cheaper, wait until the second or maybe the last day of the hamfest and go back to the dealers again to get their prices. Be aware that if you decide to wait, all of the dealers could sell out of that rig you've been wanting so badly. With the prices being so right and so many people looking for a deal, the bargains do not last long. Once again, be prepared.

And keep one other fact in mind when you tackle the dealers—the more the dealers sell, the less they have to pack up and take home. That's why most of the best deals on the remaining equipment are made on the last day of the Hamvention, on Sunday afternoon when most folks are hanging around for the prize drawing or in the process of packing up to head home.

If you have trouble working the deal you want, get the dealer to toss in an accessory for little or nothing more. After all, it would make still less that he has to pack up and take back with him and it makes the deal even sweeter for you.

What Will I See?

When you arrive at the Hara Arena, don't worry if you think your eyes are starting to bug out. You'll probably be seeing a few things you've never seen before. Just in the past few years I've seen the first synthesized handie-talkie and the first digital-readout low-band rig make their initial appearances at the Dayton Hamvention. And there's a reason for it. Manufacturers like to take the wraps off their new items at the Hamvention because they know that it's their best chance to show it to a large share of the amateur-radio community at one time. The more people that see an item, the better the chances of selling it. Remember the 20,000 plus folks I said could be walking past your flea-market space? Most of the same people will get indoors also. The manufacturers also know that most of the hams who attend the Hamvention have a buying urge, and they'd like you to satisfy that urge by buying their product.

What else can you expect to see at Dayton? I would expect to see more computers interfaced with ham-radio equipment at the '84 Hamvention, and I would expect to see more dealers selling software for amateur applications. Last year, the RTTY-CW interfaces were on display and drew considerable crowds, so this year look for the dealers to take the next logical step and explore the computer field a few steps further. We've got satellite-tracking programs that run on VIC-20s and other basic machines, so don't be surprised if software abounds to turn all of your ham-radio drudgery into funtime with your computer. After all, it will be the coming thing for many a year to come.

Here We Go!

Okay, if you've followed me so far, you should have a pretty good idea as to how to prepare for the 1984 version of the Dayton Hamvention, the hamfest that is quickly earning the tag, "center of the ham-radio universe." So get your days off arranged, pack your clothes and the equipment you plan to sell, list the items you want to purchase, get your group together, and let's head to Dayton for April 27, 28, and 29.

The bunch of terrific guys I go with started talking about the 1984 trip on their way home from the 1983 event, so I think we'll be prepared to have another great time in Dayton, Ohio. Grab your HT and come join us. It's gonna be great! ■

✓See List of Advertisers on page 130

Me and My Stupid Old PMOS Converter

At last, there's an easy way to get -12 V from a +5-V supply. Who said "trial and error"?

C. R. Bryan III WB1HKU/6
7311 Variel Avenue 4
Canoga Park CA 91303

Stupid old PMOS. It's slow, it runs hot, it gives protective input diodes a workout because its output low can go below ground, and it needs weird supply voltages. Most of the newer NMOS devices have been designed to make do with one 5-volt supply, either by some design rethinking or by inclusion of a substrate charge pump on the chip itself, but stupid old PMOS has to have strange supply levels provided in order to operate.

It was that last gripe that had me stymied for a while. I have an old keyboard from some junked phototypesetter somewhere, bought for all of ten bucks. It's TTL throughout, with maybe ½ A drain on the 5-V, 3-A supply in my home-brew Cosmac Elf. (One miserable PMOS shift register does have to have a −12 supply if I want anything but smoke from it.) At that, the keyboard outputs some weird code that makes sense only to the machine for which it was designed. A local outlet sells a keyboard encoder, the AY-5-2376. If I kludge-wired that onto the keyboard in place of the original logic, I'd have good old parallel ASCII coming out of a single 40-pin chip, made of. . . PMOS. Yep—it needs a −12 supply, drawing maybe 4 mA. I should build an *additional* line-powered power supply for *that?*

I've seen a few upconverter circuits around; most use

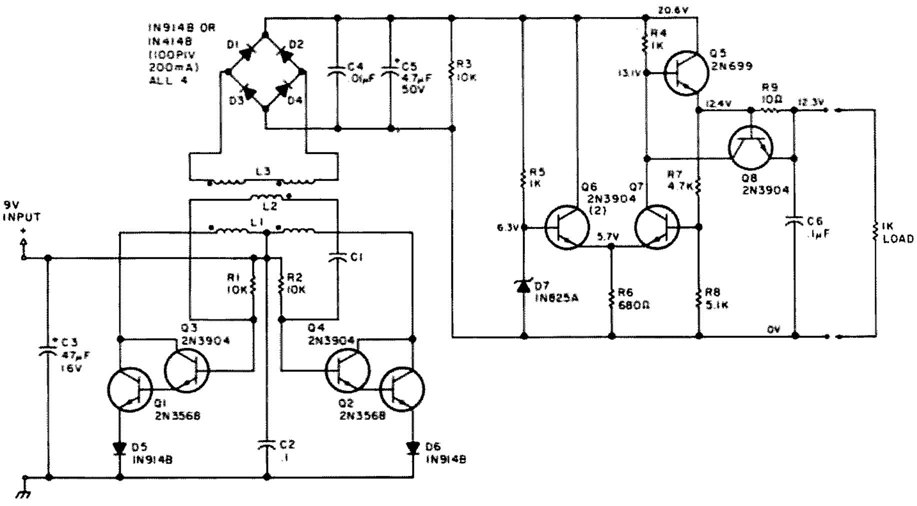


Fig. 1. Initial version. With 9 to 19 volts input, and the right toroid, this circuit might provide 50 V output. L1 is 10 bifilar turns #28, L3 is 25 to 50 bifilar turns #28 (I used 25 turns), and L2 is 8 to 10 turns #26. The toroid is a .375-inch ferrite from a Radio Shack "Ferrites" package. Capacitor C1 resonates with L2 to determine oscillating frequency; 200 pF is probably a good minimum value to keep interwinding capacitance from getting into the act. The transistors came from my junk box; the numbers listed are their rough functional equivalents. With different devices, the regulator circuit could waste a lot less current.

555s and voltage-doubler chains. Motorola even has one with a 7406. Somehow, all these capacitor-pulse designs struck me as being wasteful, inadequate, or both.

I'm a bit of a QRPp nut, and I have the toroids to prove it—some from Radiokit and Amidon, some from those blister cards Radio Shack started selling a year or so ago. I got out my dipper and my boxes of small-signal transistors, turned on the 'scope and the Weller, and waded in.

The first circuit I built does fine with at least 9 volts for a supply. The rectified secondary voltage soared up to 90 volts at one point in my experimenting—no load. That's why I put in the 10k load resistor, to keep the voltage within the survival zone of the diodes, to say nothing of any regulator I might care to put in.

As for the regulator circuitry, I must admit that I was playing. I had already decided to put a 79L12 in the finished unit, but I didn't have one on hand as yet, so I kludged this one up in order to see how much fun I could have putting together a regulator. If you look closely, you will see not only that I've abused the reference diode (which prefers to conduct only about 7.5 mA), but also that the converter is cranking out upwards of 25 mA, still with enough input headroom to the pass transistor for it to regulate. The medium-current pair of transistors in the oscillator got warm, but not hot, and nobody seemed to be hurting.

Then I dropped the supply rail to 5 volts, and the output got very mushy . . . maybe 8 volts across the output load resistor.

The problem is in the Darlingtons. I put in the second pair of transistors, Darlington-style, because the medium-current transistors weren't being driven fully under load, thus, there was not enough gain at the frequency in use. The added pair corrected that but brought in a new problem: The saturation voltage ($V_{CE\text{-}sat}$) for a Darlington pair, measured from the ganged collectors to the lower emitter, is one $V_{CE\text{-}sat}$ plus one V_{BE} for a typical circuit, because the driver-half emitter is held high by the final-half base-emitter diode (one V_{BE}), and their collectors are tied together. The collector of the driver-half can't do more than saturate—it can't go lower than its emitter. More current into either the driver's base or the two collectors only drives both voltages higher, making the problem worse. I was losing virtually 2 V_{BE} on each side of the main winding, even with the protective series diodes shorted out. That's fine for circuits with, say, 9 volts or more rail-to-rail, but down at a 5-volt supply level, the missing voltage swing was proportionately too large to be ignored.

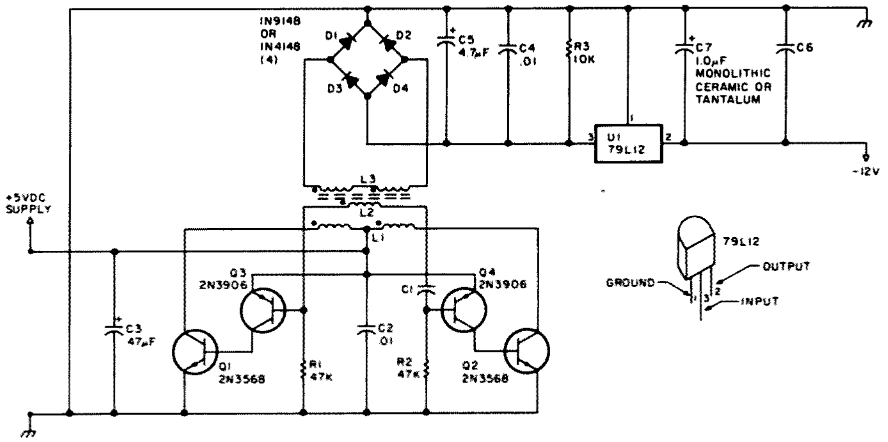


Fig. 2. 5-volt-input version. Note that L2's phase is reversed. Equivalent transistor types again. The 79L12 only burns about 4 mA.

At this point I remembered the composite PNP in the final stage of National's LM380, and the final version started emerging on paper.

I have even more voltage gain here, because the driver stage is running common-emitter rather than the common-collector driver in the Darlington version. More important, the final stage is free to pull its end of the transformer's main winding as low as possible, roughly 0.2 volts with these particular parts. That means that the total possible swing for the transformer, ignoring coil losses, is 9.6 volts—much better. Of course, I've ignored here the effect of available voltage swing on circuit impedance, which affects the available juice (wattage) from what is, in effect, a self-excited balanced transmitter. I chose a more rudimentary approach, one within my immediate comprehension. In other words, I'm lazy, so I just called it an astable multivibrator and I played around with it until it worked.

It works. The keyboard converter starts up every time and feeds a dead quiet −12 volts to the shift register. It'll do the same for the 2376 instead, when I get around to the surgery involved. Then there's that Motorola character generator for translating ASCII into a video bit stream; that needs two weird voltages—and it's NMOS! That just means there'll be two secondaries on the toroid. I've even got a couple of PMOS character generators that need ±14 volts.

There are several points of design and technique to be mentioned here. First, most bipolar transistors behave very nicely like zener diodes when their bases are driven 5 to 10 volts more negative than their emitters (positive for PNPs). Unfortunately, the localized heat in the base region of the transistor chip causes permanent changes in the doping arrangement, so the beta goes down. This is why most multivibrator designs have diodes with high PIVs in them, to keep the sharp negative spike through the capacitor from doing damage. If you are running such a circuit with a supply higher than 5 volts, you must have them too. Otherwise, if the 'scope shows that the collector voltage has a needle-thin negative spike going lower than ground on the falling edge of its waveform, your transistors are being degraded even as you watch.

The second point is one of balance. Some of Doug DeMaw's QRP amplifier designs are *crawling* with toroids, just to swamp out tolerances and force a 50% duty cycle in the output signal. I got by with just one toroid by using the twisted-pair wiring shown, but a little artistic symmetry in windings placement is required too. Caveat constructor.

The third point is the toroid itself. I used some from those Radio Shack packages, and they work very well. The ones you will pull out of there might not—it's a matter of size

and ferrite mix. The highest-permeability device is the one to use, because you get more inductance per turn of wire (mine were around 350 uH with ten turns). Such toroids are designed for a lower frequency range, so you can run them at a lower frequency, where the diodes rectify better (I've run the prototype up to 2 MHz, but its overall efficiency is best at around 50 kHz), and where it's a lot easier to contain the rf that any power oscillator spews out. The 2-MHz version wreaked havoc with an AM radio across the room; the 50-kHz version doesn't bother it a bit, even though the lower frequency is more likely to provide harmonics within easy reach of BCB carriers. My guess is that the diodes, which do take a finite amount of time to go into and out of conduction, simply digest the lower frequency more thoroughly, reflecting a lot less trash back into the oscillator.

The less rf noise, the less shielding is required, and the less hassle you have arranging for air flow to carry heat out of that shielding.

My converter simply sits parked in one corner of that keyboard, unshielded, kludge wired into holes drilled in an etched-clean section, making less noise than the keyboard scanning clock.

Obviously, anywhere one or two greedy little circuits demand a strange supply

Parts List (for Fig. 1)

C1	200-pF silver mica
C2, 4, 6	CK05, 104k, .1-uF monolithic ceramic (Better than a disc capacitor for high-frequency decoupling because the internal sandwich construction results in a low-inductance package. Substituting for one usually involves a .01-uF disc ceramic paralleled with a .001 disc or a 100-pF silver mica. Here, a .01-uF disc will do.)
C3	47-uF, 16-V aluminum electrolytic
C5	4.7-uF, 50-V aluminum electrolytic (Up to around 25 uF is useful at this current level; more than that can cause start-up problems for the oscillator, due to loading.)
D1–6	1N4148 or 1N914B switching diodes
D7	1N825A temperature-compensated reference diode (It consists of a reverse junction in the same package with a forward junction; at 7.5 mA of current through the diode, the complementary temperature coefficients of the two junctions cancel each other out. With the voltages shown, the current through the diode in Fig. 1 is nearly double the correct value, which doesn't hurt it but wastes both the current and its compensation. Newark Electronics' Catalog 105 lists it for $1.90.)
L1, 2, 3	See text
Q1, 2	NPN medium-current switching transistors (The faster the better. I used 2N3568 equivalents; 2N2219A is easier to find.)
Q3, 4	NPN switching transistors (The faster the better. 2N3904 is widely available.)
Q5	NPN medium-current transistor (Speed isn't critical, but gain and wattage are. I used a 2N699, which is barely adequate. It should be at least a heat-sunk 2N2219A, maybe a TIP48. Better to be overcautious on wattage than to worry about its surviving a short or a still-air heat buildup.)
Q6, 7, 8	NPN small-signal transistors (I used 2N3904 equivalents. With higher beta, resistor values in the regulator may be raised, conserving current. Beyond the voltages shown, start paying attention to the collector-voltage ratings of these devices.)
R1, 2, 3	10k, ¼-W (With the regulator in place, R3 isn't really necessary, but it's a cheap security blanket.)
R4, 5	1k, ¼-W (As mentioned, R5 should be a 1.8k.)
R6	680-Ohm, ¼-W
R7	4.7k
R8	5.1k (The regulator (Q5–7) regulates by keeping the R7-R8 voltage divider's tap at the same voltage as the reference (6.3 V In Fig. 1). Their ratio sets the output voltage.)
R9	10-Ohm (This resistor sets the current-limiting level. When the voltage across it reaches the .6-V turn-on threshold of Q8, Q8 will begin stealing base current from Q5, turning it off. With this value for R9, that's at 60 mA output.)

Parts List (for Fig. 2)

C1	Select in test (200-pF starting value, may end up at .01 uF or higher. In order of preference: NPO ceramic, polystyrene, silver mica, mylar™, disc ceramic. The higher the frequency, the more the capacitor's quality matters. 220-pF silver mica: Jameco DM15–221J, 49¢.)
C2, 4, 6	.1-uF monolithic ceramic or .01-uF disc ceramic (.01 uF: Jameco DC.01/50, 8¢.)
C3	47-uF, 10-V electrolytic (47-uF, 16-V: Jameco A47/16, 24¢.)
C5	4.7-uF or more electrolytic (Working voltage should be at least 1½ times unregulated output voltage. 4.7-uF, 50-V: Jameco A4.7/50, 19¢.)
C7	1.0-uF tantalum or 10-uF aluminum electrolytic. (Working voltage should be significantly higher than regulated output voltage. 1.0-uF, 35-V tantalum: Jameco TM1/35, 29¢.)
D1–4	1N4148, 1N914B, or other silicon signal diodes (Should be rated for minimums of 50 PIV, 50 mA continuous forward current, maximum switching time 10 ns or so. 1N4001-type rectifiers can't switch fast enough. 1N4148: Jameco, 15/$1.00. Fairchild rates these devices at 100 PIV, 200 mA, 4.0 ns.)
L1, 2, 3	Windings are determined by application and circuit values. See text and schematic for prototype values. Bifilar windings are prepared by twisting twin lengths of pretensilized wire with electric drill to 10–20-turns-per-inch pitch. Toroid is from Radio Shack package of ferrites. A good equivalent is Micrometals FT50-43: Radiokit, 60¢.
Q1, 2	NPN medium-current switching transistors—2N2219A, MPSU06, 2N3568 (Dissipation limit should be at least ½ W. 2N2219A: Jameco, 2/$1.)
Q3, 4	PNP switching transistors—2N2907, 2N3906 (The faster the better. 2N3906: Jameco, 4/$1; Priority-One #052N3906, 5/$1.)
R1, 2	47k, ¼-W (Priority-One #05RCQ473L, 50/$1; Radio Shack #271-1342, 5/39¢.)
R3	10k, ¼-W (Priority-One #05RCQ103L, 50/$1; Radio Shack #271-1335, 5/39¢.)
U1	Motorola 79L12 in prototype (Device choice depends on application. PC layout will accept 78XX, 79XX, LM340, and LM320 devices with inline pins (L, P, M, T types). Check pinout before installing. Positive regulator may be used to regulate negative voltage by making regulator output common. 79L12: Priority-One #05MC79L12CP, $1.00.)

Converter will be most efficient in a frequency band whose low end is determined by transformer reactance and whose high end is determined by transistor and diode speeds and capacitor quality.

voltage, you can now satisfy them, literally on the spot.

This circuit can go in any number of directions. A better design could probably run an 8080A chip set with just 5 volts input. If you have both phases of a convenient frequency clock available, you can slave the converter to the clock and save yourself a few parts, guaranteeing the converter start-up in the process. A couple of VN10KMs (VMOS) would probably suffice, provided only that the clock signals swing fully rail-to-rail. (TTL typically needs a pull-up resistor to hoist its output above 3.5 volts.) Somebody else will probably put me to shame with the efficiency of their version, but that's okay; I just wanted to get that keyboard running on just a +5-volt supply. Stupid old PMOS. ■

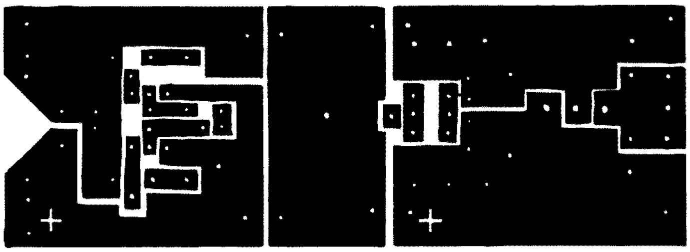
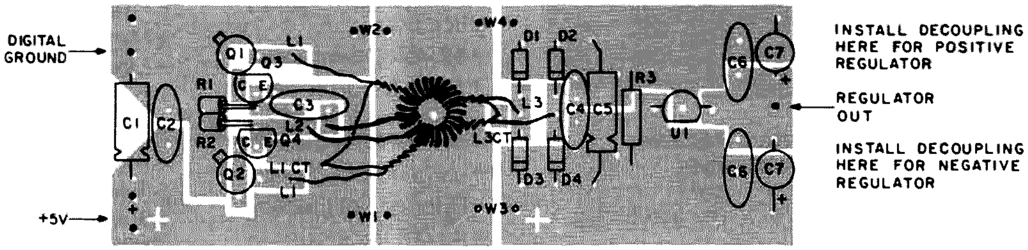


Fig. 3. PC board for the 5-V version.



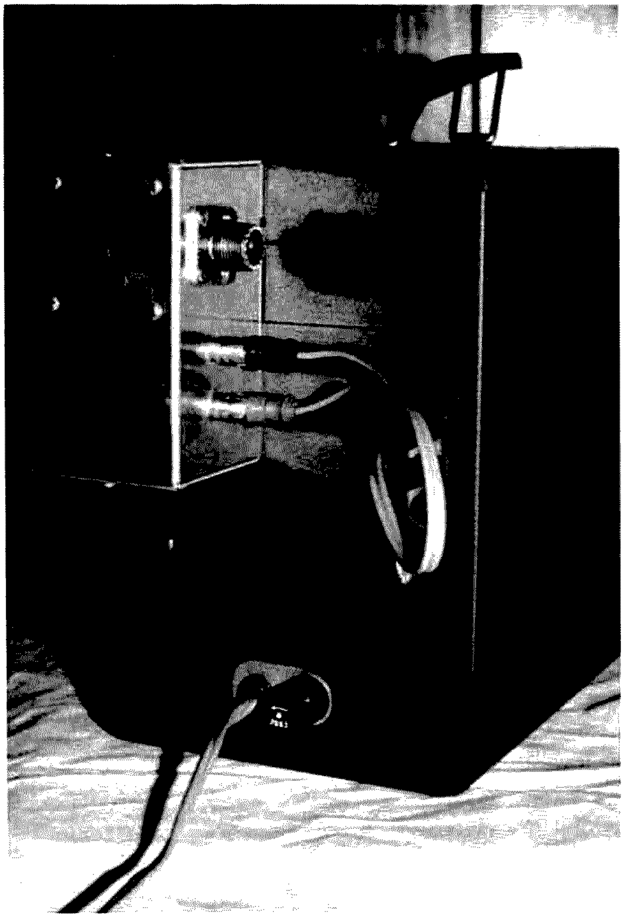
JUMPERS W1-W4 ESTABLISH GROUNDING, IF ANY
(U1 MAY BE 78XX OR 79XX DEPENDING ON APPLICATION.
TO-92, TO-220, VERSAWATT PACKAGES WILL FIT.)

Fig. 4. Component layout.

L. B. Cebik W4RNL
5105 Holston Hills Road
Knoxville TN 37914

Watch That Signal!

Haul out your old oscilloscope and turn it into a signal monitor. The conversion is easy and the price is right.



An external view of the adaptor shown in Fig. 8, with shielded connections to the rear of the scope and onward to the vertical deflection plates.

Oscilloscope adaptors for rf have been around a long time. They became popular with the advent of SSB and inexpensive scopes after the end of World War II. Today, many of the leading ham equipment manufacturers, including Heath, Yaesu, and Kenwood, provide matching scope units for monitoring transmitted—and in some cases, received—signals. The equipment is excellent, but so is the price tag. There are cheaper ways to have an effective monitor, especially if you are interested only in seeing your transmitted signal. All you need is a cheap working scope and a simple adaptor. Fig. 1 shows in simplified form what we need.

As simple as this scheme is, relatively few hams monitor their transmitted signals or use monitors for making adjustments. The part of the equation that stops most hams is probably the scope itself and not the adaptor. There are several good working designs, and we shall look at a few before closing. However, the idea of owning and then modifying an oscilloscope still creates anxiety in many hams. So let's begin by looking at what makes a good scope for rf work.

Choosing a Scope for Rf

Current scope specifications make the units of even fifteen years ago look barbaric by contrast. The modern scope has triggered sweep calibrated in fractions of a second per division on the scope face. We can no longer create some

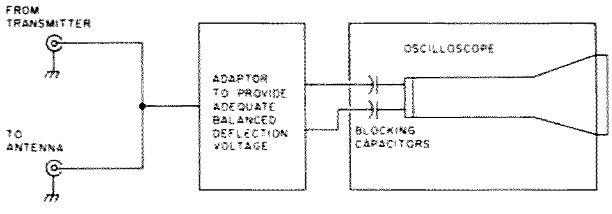


Fig. 1. The basic elements needed for rf monitoring.

of the funny pictures of yore because the recurrent sweep, calibrated in frequency, is gone. Virtually all scopes are solid state. Dual-trace capability is the rule rather than the exception. The frequency limits of the vertical amplifier have gone out of sight. Except for very expensive lab scopes, a 5-MHz limit was rare twenty years ago; today, the limit is fast approaching 100 MHz, with 20- and 30-MHz units common. One other thing has kept pace with the rising specifications: the price.

Modern scopes are excellent. If you own one, then rf monitoring is a simple matter of taking an exceedingly small sample of your transmitted signal and feeding it directly into the vertical amplifier of your scope. You need no adaptor. Unfortunately, few of us have the money for a 30-MHz scope that will get only an occasional workout in the shack. Indeed, if we have access to such a piece of equipment, it will most likely go on the test bench where it will be used more regularly.

If we do buy an older scope, our tendency is to choose one of recent vintage. This would be a solid-state scope with at least one MHz, and perhaps five, as the vertical amplifier limit. It would have recurrent sweep and single trace.

I should have stopped the moment I mentioned solid state! Although there are good solid-state scopes capable of handling the 50-odd volts of rf that we shall put into the case with at least an inch or two of lead, few of the cheap units have sufficient shielding between the amplifier boards and the neck of the scope tube where our leads are needed. The odds of popping one or more transistors is very great. We can add shielding, but our chances of successfully eliminating all rf danger are slim to nonexistent. Modern solid-state monitors begin with this problem as a design consideration, and it may be easier to build a scope from scratch than to rebuild a solid-state unit that was never intended for rf service.

Tube-type scopes of the next preceding generation do not suffer the problems of solid-state scopes. A few volts of rf in the case will not injure the tubes or other components. A hamfest will turn up many of these scopes for sale. The main item of concern is the quality of the cathode-ray tube and the power transformer. Both are difficult to replace and costly at best. If the scope puts out a bright, well-defined trace with the intensity control at the halfway point, then other faults can be repaired with the investment of troubleshooting time rather than money.

For an rf monitor at the operating desk, I prefer a smaller scope to the round-faced five-inch models. Toward the end of the tube era, a number of compact three-inch units appeared, including the Eico 435 and 430. The 8½" by 6" by 11" audio frequency 430 cost $69.95 in kit form in 1965, and it may be worth half to two-thirds of that price at a hamfest if it is in excellent condition. If you prefer a larger scope face, there are numerous Dumont and Heath models (among others) that can be picked up for a song and a few greenbacks.

Getting a scope is half the battle. Modifying it for direct rf input is simple. Locate the vertical deflector plate terminals on the scope tube socket. As close as possible to these terminals, install a pair of connectors on the rear panel of the scope. Phono connectors work well if you use thin coax for the leads from the adaptor (one lead for each terminal, since the signal will be balanced). Pin jacks or similar connectors will work if you use twinlead or other balanced lines from the adaptor;

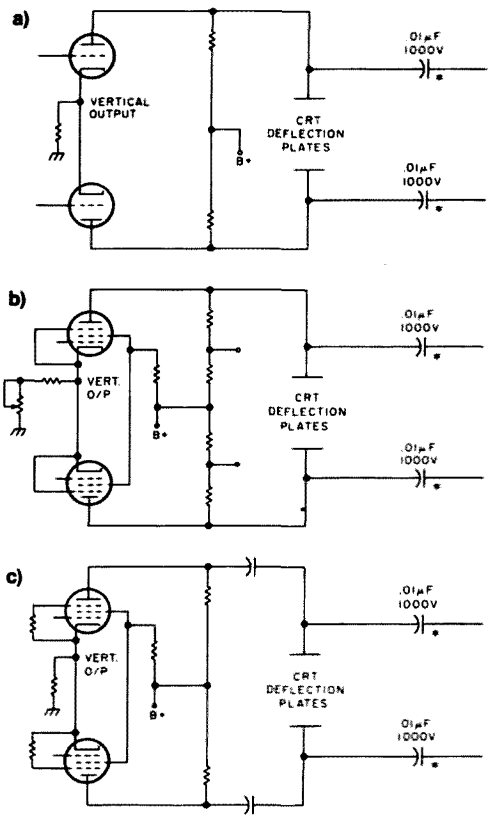


Fig. 2. Rf connections to typical vertical amplifier circuits. (a) Triode dc-coupled output stage. (b) Pentode dc-coupled output stage. (c) Pentode ac-coupled output stage.

however, shielded leads are best, especially with higher power.

Between the socket terminals and the jacks, install .01-µF disc ceramic capacitors of at least 1000-volt rating. Keep the leads as short as possible, and try to keep the capacitors at right angles to anything to which you might couple signal. Many scopes used to have accessory jacks on the rear panel for any number of improbable uses (for example, dc voltages to power units under test if they by chance happened to require exactly the voltages provided at a very limited current). If these are close enough to the scope tube socket, then mechanical work will be further minimized.

Fig. 2 shows the connections schematically, along with some typical vertical amplifier connections to the same socket pins. In most cases, you will need no other work on the scope. It will operate normally when rf is not present. When using the scope to monitor your transmitter, keep the vertical gain at minimum, and if you have input attenuator positions, set them at maximum. For monitoring, we simply bypass the vertical amplifier and generate the voltage needed to deflect the trace vertically by other means.

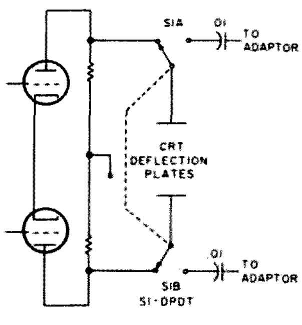


Fig. 3. Isolating rf and normal scope signals.

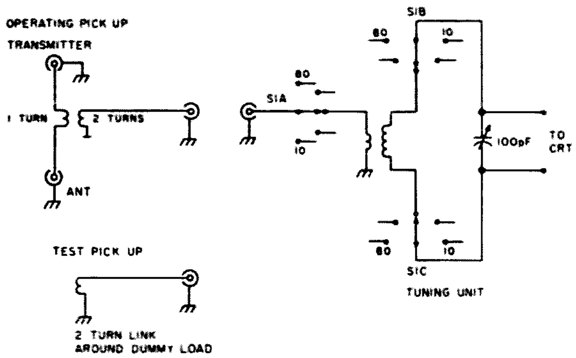


Fig. 4. The typical adaptor circuit of the 1960s.

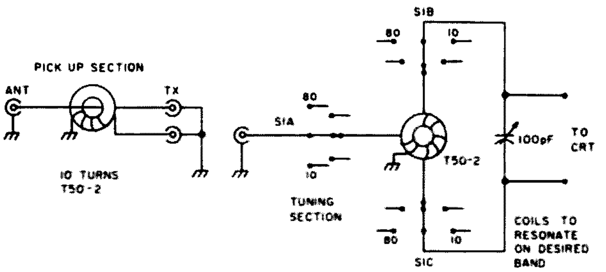


Fig. 5. A miniaturized version of Fig. 4, utilizing toroid cores.

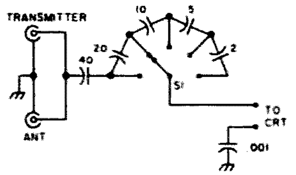


Fig. 6. A simple rf scope adaptor in wide use today.

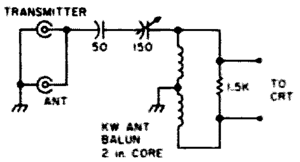


Fig. 7. The VE7CGK adaptor.

If you encounter problems with the use of the scope for non-rf purposes, then you will want to install the double-pole, double-throw switch shown in Fig. 3. This will effectively isolate the two modes of operation.

Rf Adaptors Through the Years

While almost every other piece of electronic equipment has grown more complex through the years, rf adaptors for oscilloscopes have grown simpler. I have built most of the designs, discarding them as a more compact arrangement became available. My present unit fits in a 2"×2"×4" aluminum box mounted on the back of my scope, with only one switch to manipulate. The photo shows how compact the adaptor can be. We may never reach the ultimate miniaturization in anything, but if another adaptor design comes along, I will hesitate before replacing the present unit.

Most early designs used tuned circuits, one for each band. Fig. 4 shows the general design which was fairly standard for about a decade. There were two separate boxes: a pick-up unit and a tuning unit. The pick-up box contained a one-turn coil running between the input and output coax connectors, with a two-turn link running to the tuning unit. The idea was to minimize the impedance bump in the transmitter transmission line.

The tuning unit went through stages of evolution. Initial designs were open breadboards. You were expected to tack-solder a coil each time you changed bands. Plug-in coils followed, but they required you to open the shielded box which was added to the design. In 1970, W1KLK mounted all the coils on a rotary switch (*QST*, October, 1970, p. 36). He also used the smallest diameter coils I had seen to that time, ranging from ½ inch for 10 meters to 1¼ inches for 80.

The principle of the design was to generate the necessary deflection voltage through the high Q of the tuned circuit. The tuning capacitor, insulated from the front panel and the operator's hand, provided peaking when tuned to resonance. If the voltage provided too much deflection (somewhat a rarity with older, less sensitive cathode-ray tubes), detuning the circuit attenuated it effectively. Despite its size, the unit worked very well.

The same design can be significantly miniaturized through the use of toroid cores for the inductors throughout, as shown in Fig. 5. The schematic diagram is essentially the same, although some changes have been made in the drawing to indicate the mechanical changes. A short straight line with Teflon™ insulation runs between the coax connectors and through a half-inch core. I have used from 6 to 20 turns of #28 wire in the secondary without disturbing the line impedance seriously. The tuned circuit coils in the aggregate take less room than the switch on which they are mounted. Although a three-section switch is shown, I have also used a two-section switch, with one side of each coil (and the capacitor) to a common. This did not seriously upset the balance of the output. The entire unit can be mounted in a single box with a partition between the pick-up and tuning sections.

Recent Adaptor Designs

More recently, designers have realized that tapping a 50- or 75-Ohm coax line would cause no significant problems if the tap impedance was fairly high. This has resulted in the use of almost direct connections between the rf line and the scope tube. Fig. 6 shows a generalized idea of the scheme. The switch controls a selection of capacitors arranged to successively double the reactance and lower the signal level seen by the scope plates. Since the scope deflection plates require a balanced input, the ground side is elevated off ground. The system is perfectly adequate for most monitoring purposes, although a better balance is easily achieved.

In 1979, VE7CGK presented an interesting scheme (*73*, June, 1979, p. 110); it is shown in Fig. 7. His balun used an ordinary 2-inch-diameter antenna core. The swamping resistor across the core is non-critical in value, and anything with up to a three-to-one ratio to the value given seems to work. It evens the frequency response by lowering the Q of the coil. However different his coupling scheme appears to be from that in Fig. 6, it is electrically identical. He has used a variable capacitor (with a series fixed capacitor) to replace the switch. Like all the units shown, his works well, with one exception. It is difficult to find a variable capacitor with a 150-pF top value that will go below 10 pF minimum. The 5-pF value in Fig. 6 is needed when viewing kW signals on a sensitive scope tube.

The final design that fits into the small box shown in the photo combines the best of these two designs with some miniaturization thrown in. Fig. 8 shows the circuit. The capacitor section is standard. The balun is

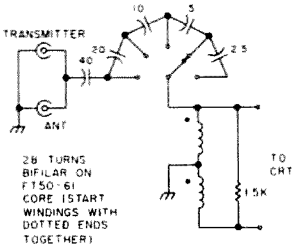
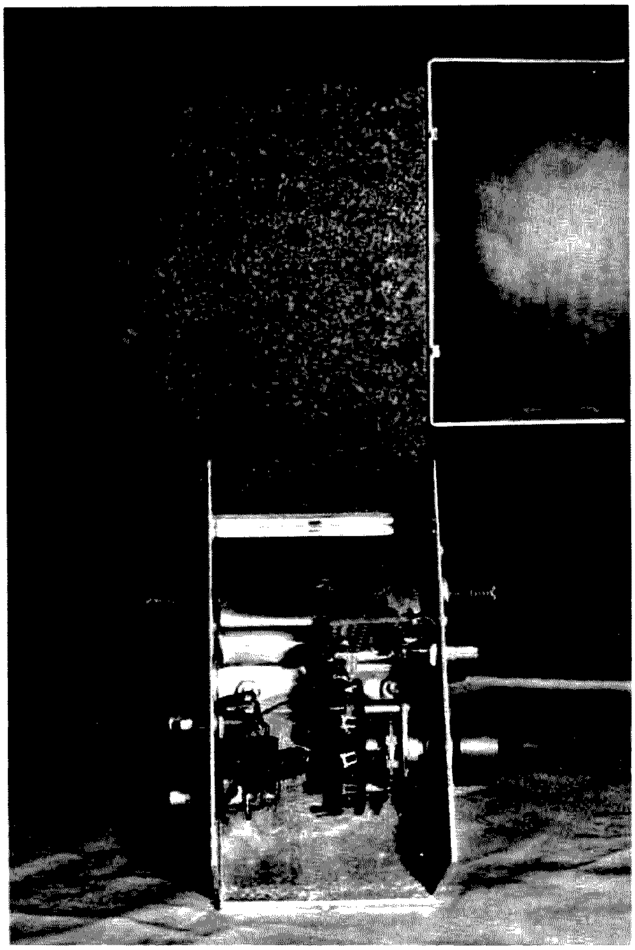


Fig. 8. The hybrid miniature scope adaptor.

wound on an FT 50-61 core and is designed for about 1200-Ohms impedance at 3.5 MHz, or about 54 microhenries per section. Twenty-eight turns bifilar, connected as shown, meet the requirement.

Construction is simplicity itself. As Fig. 9 shows, the switch is mounted on one side of the U-shaped channel of the box, the output jacks on the other. A thin aluminum cover with a hole for the capacitor lead covers the wire between coax connectors. The remaining part of the box mounts on the rear of the scope, so the unit is almost a plug-in device. Leads from the adaptor to the scope are kept short, partly by careful thought beforehand on parts arrangement. Construction can vary according to what is convenient in terms of your scope. The only rules to follow are the usual ones about short leads for rf.

The response of this adaptor is smooth across the ham bands from 80 to 10 meters, with no significant difference in the deflection of equal power signals among bands. Nor are there any peculiar peaks or other odd quirks. In short, the adaptor does its passive task tamely but effectively. Position 2 on the switch is used for the normal 100-Watt output from the rig and yields over an inch of deflection. Position 1 permits viewing of much lower power signals. The output from my SB-200 produces about an inch and a half of deflection in position 4, thus confirming that the capacitor choice is adequate for the most common range of ham signals. The scope which the adaptor feeds, incidentally, is an Eico 430.



Interior view of the adaptor shown in Fig. 8. The metal shield near the top covers the through line from transmitter to antenna, while the switch holds the capacitor-divider. The broadband transformer balun is mounted between the output jacks at the lower right. The small perfboard holds an envelope detector for synchronizing the scope's sweep.

Using the Adaptor

Synchronizing the monitored signal to the scope sweep is desirable but not essential to the observation process. It is useful and possible with CW dots or dashes sent at a constant rate (easily done with an electronic keyer) and with two-tone tests on SSB. For the usual Christmas-tree pattern seen in casual monitoring of SSB or for AM trapezoidal patterns, sync is useless. Nonetheless, the technique for deriving a sync voltage is simple in principle and deserves mention.

Fig. 10(a) shows a simple AM detector typical of those found in rf probes. With the isolating resistor, its output is very low, too low to drive the external sync connections on many scopes. The problem becomes clear in Fig. 10(b), block diagrams of two types of sync inputs. In one case, external sync is amplified before going to the sync limiter. In the other, sync voltage goes directly to the limiter. A small external sync voltage cannot drive the second circuit without further amplification. For two-tone testing SSB signals, an audio amplifier works well, but for CW, a dc amplifier is better. If your scope has a stable sweep oscillator, this additional circuitry adds little to the effectiveness of monitoring, but it does create a need for feeding power to the adaptor which is otherwise a passive device. For standard linearity patterns, of course, a pair of detectors is needed, but since the regular horizontal and vertical inputs of the scope are used for the test, no power source is needed.

Using the monitor is an easy process. Connected as shown early in the article, the adapted scope will dis-

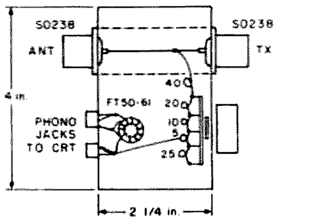


Fig. 9. Physical layout of the hybrid scope adaptor.

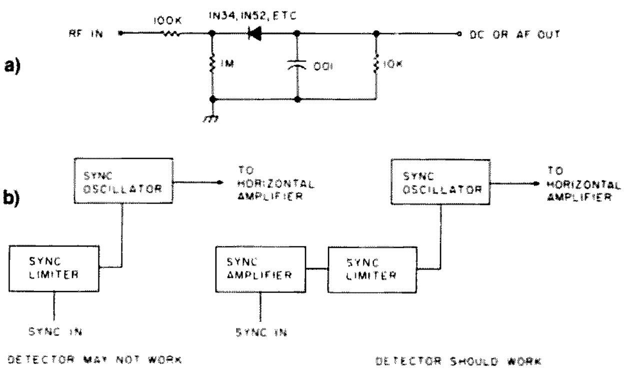


Fig. 10. A simple envelope detector for linearity checks and sync. (a) Envelope detector. (b) Scope sync systems.

Parts List

1	Single-pole, 5-position rotary switch	Radio Shack and other sources
1	FT 50-61 ferrite toroidal core #28 enamel wire (28 bifilar turns on core)	Amidon and other sources
2	SO-238 coax sockets	Radio Shack and other sources
2	phono sockets	Radio Shack and other sources
1	1.5k-Ohm, ½-Watt resistor	Radio Shack and other sources
1	40-pF silver mica capacitor	Available from mail-order sources such as Semiconductor Surplus
1	20-pF silver mica capacitor	
1	10-pF silver mica capacitor	
1	5-pF silver mica capacitor	
1	2.5-pF (or two 5-pF in series) silver mica capacitor	Note: disc ceramic capacitors with 350-volt or higher ratings will substitute for the silver micas
1	2¼" x 2¼" x 4" aluminum utility box	Radio Shack and other sources

Total cost: $10, if all parts new; under $5 with surplus and/or used parts.

play CW waveforms, plus two-tone and Christmas-tree SSB patterns. No better observation of CW make-and-break patterns has been invented, and the results of adjustments to component values become immediately apparent. With respect to observation of SSB, the simple adaptor technique might be considered somewhat archaic. A spectrum analyzer will in fact provide more sensitive indications of incorrect linear-amplifier adjustment. However, a spectrum analyzer is an expensive piece of equipment.

The two-tone test provides good indications of improper amplifier adjustment if the operator takes the time to become personally familiar with and sensitive to the meaning of the curves. Handbooks of a few years back provide ample drawings of various conditions of operation and their meaning.

Some recent materials on the subject have bent over backward to discredit our ability to read two-tone envelope patterns effectively. This is true only if we do not thoroughly learn the peculiarities of our equipment. The idiosyncrasies of each amplifier and each scope require that we make extensive on-the-air and dummy-load tests to discover at what point slight flattening of the pattern top, or slight curvature to the pattern sides, means distortion of our voices or adjustments of the drive or loading which are out of spec. We may not be able to match laboratory results, but we can keep our rigs well within FCC regulatory requirements and well within what courtesy to other operators dictates.

Despite the fact that rf adaptors for old audio scopes have been supplanted by more sensitive methods of monitoring, it will be a long time before we can all afford up-to-date test equipment. In the interim, a small investment (maybe $30 to $50 for a used scope and $5 for the monitor) can go a long way toward helping us put out cleaner signals. The tiny monitor box shown here (which might even fit inside some of the large old scope cases) makes the process of monitoring one step easier. I only wonder how small the next monitor design will be. ■

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Digital Design: How to Interface ICs

Connect ICs to the outside world with these hints from the author of "Digital Basics."

The reader response to my three-part series titled "Digital Basics" (*73*, September through November, 1982) was overwhelming even to an old tech-writing hack like myself. In addition to receiving more than a dozen positive letters (and no negative ones), I received a consulting offer; writing for *73* surely pays!

One theme which popped up in about one-third of the letters was digital interfacing. Readers wanted to know how to interface various digital IC logic families with each other and with the "outside world." In this extension of the original series, we will discuss interfacing techniques and how they can be applied in practical situations.

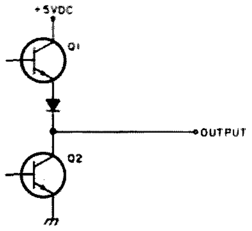


Fig. 1(a). TTL totem-pole output.

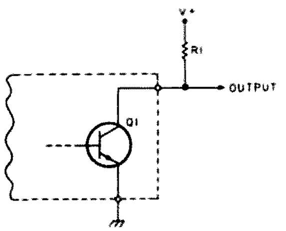


Fig. 1(b). TTL open-collector output.

Logic Family Outputs and Inputs

Most readers will be using either the transistor-transistor-logic (TTL) or complementary-metal-oxide-semiconductor (CMOS) and related MOS families. These will be the devices discussed in this article.

Before we can become too deeply involved in any discussion on interfacing, we must become familiar with just *what* is being interfaced. For digital electronics, this means a review of the input and output circuits of the devices, since these are what will be connected together.

The TTL logic family operates from a single-polarity dc power supply of +5 volts dc and ground. This supply must be regulated to keep the voltage within a narrow range—4.75 to 5.2 volts. Some texts permit slightly broader limits, but practical experience indicates that voltages lower than +4.75 volts cause erratic operation, especially of complex function devices, while potentials over about +5.2 volts lead to premature failure of large numbers of chips. I personally prefer to keep the potential within the even narrower range of +4.9 to +5.05 volts dc.

The TTL output stage is a *current sink* to ground, while the TTL input is a *current source*. Figs. 1(a) and 1(b) show two popular forms of TTL output, while Fig. 1(c) shows a typical TTL input circuit. The high and low logic levels in TTL are specified in terms of the voltages that satisfy the input requirements.

The high level will be anything between +2.4 volts and +5.0 volts. In most TTL devices, the output will produce a potential greater than +2.4 volts for high, but considerably lower than +5 volts; potentials in the 3.0-to-4.0-volt range are most frequently found. The low condition is defined as any potential between 0.0 volts and 0.8 volts, i.e., 800 millivolts. The region between 0.8 volts and +2.4 volts is undefined and is therefore to be avoided. One problem seen in some interfacing situations is the creation of a circuit that will not bring the outputs to within the defined high and low limits, thereby creating an unpredictable situation.

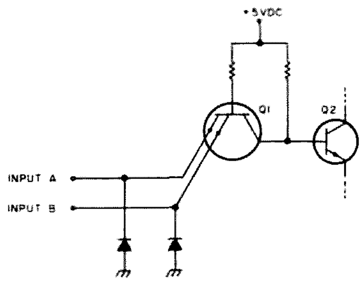


Fig. 1(c). TTL inputs.

One advantage of using IC logic elements is that we are free to avoid the problems of impedance matching (and other related headaches) when connecting the devices together in cascade. We can use the concepts of *fan-in* and *fan-out*. The term fan-in defines the load presented by any device in terms of standard TTL input loads. Since the TTL input is little more than a 1.6-milliampere current source, we define a fan-in of 1 as a current source of 1.6 mA, at standard TTL logic voltage levels. The fan-out is the drive capacity of a logic device defined in terms of the number of standard 1.6-mA TTL loads that the output will drive. In most devices, the fan-out is ten, so the device will successfully drive up to ten standard TTL loads. (In other words, it has

a 16-mA output current sink capacity.) Some special devices called *buffers* or *line drivers* typically will have fan-outs of thirty, but up to one hundred are known.

Most TTL devices have an output circuit such as the one shown in Fig. 1(a). The output circuit is a totem-pole power amplifier consisting of two NPN transistors. A blocking diode prevents current flow from the output terminal through Q1 to the +5-volt power-supply line. When the output is low, transistor Q1 is turned off and Q2 is turned on. This places the output line at or near zero volts. The actual potential will be the Vce(sat) rating of Q2, which may be as much as 0.8 volts. In the opposite condition, when the output is high, the opposite occurs: Transistor Q1 is turned on and R2 is turned off. This places a potential on the output line that is the +5-volt power-supply voltage less the Vce(sat) rating of Q1 and the junction drop of the series diode (normally 0.6 to 0.7 volts).

An alternate form of TTL output is the *open-collector* circuit of Fig. 1(b). The open-collector device is used to drive external devices and is a prime tool in interfacing with other logic families as well as with the "outside world." Transistor Q1 will be connected to the V+ (which is not always +5 volts, even though the package power-supply voltage must be +5 volts dc) through a pull-up resistor or another form of load. Normally, if a simple pull-up resistor is used for the load, we will need 2000 to 3000 Ohms for +5-volt power supplies, and proportionally higher for higher potentials. TTL devices with open-collector outputs include the following hex inverters: 7405 (+5-volt supply only), 7406 (to +30 volts at up to 30 mA), 7416 (to + 15 volts at up to 40 mA), and the following hex non-inverting buffers: 7407 (30 volts, 30 mA) and 7417 (15 volts, 40 mA). These devices are of prime concern for our interfacing chores. Note that certain other TTL devices also have open-collector outputs.

An example of a TTL input circuit is shown in Fig. 1(c). The device shown here is a two-input circuit as is found in each section of a device such as the 7400 two-input NAND gate. Each input will source up to 1.6 mA of current.

A CMOS inverter circuit is shown in Fig. 1(d). The typical CMOS device will have a pair of complementary MOSFET transistors connected in series with the output taken at the junction between the two. Transistor Q1 is a p-channel MOSFET, while Q2 is an n-channel MOSFET. These devices have opposite properties such that Q1 will be turned off (high-resistance channel) by a high applied to the input, while Q2 is turned on by a high on the input. Thus, for each different binary logic level, we will always have a series circuit consisting of a high resistance and a low (approximately 200 Ohms) resistance. For output-low conditions, there will be a high resistance to V+ (Q1 off) and a low resistance to V−(Q2 on). For the output-high condition, exactly the opposite occurs: there is a low resistance to V+ (Q1 on) and high resistance to V− (Q2 off).

Thus, we will see the CMOS output sink current on low and source current on high. Although this fact is not needed when interfacing CMOS-to-CMOS, it is useful for other interfacing chores.

The CMOS input is essentially an open circuit. CMOS devices operate using electrostatic fields derived in the channel from potentials applied to the gate terminal. This terminal is insulated by a thin metal-oxide layer and thus represents an immensely large resistance. Various

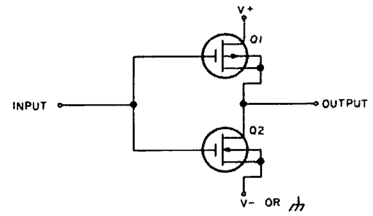


Fig. 1(d). CMOS inverter, showing inputs and outputs.

authorities quote not less than 1 megohm, with some going to 10^{12} Ohms. Thus, many CMOS devices can be driven from the same output with regard for current-driven capability. There may, however, be capacitance limitations, especially where a rapid rise time must be maintained.

Interfacing Between Logic Families

Fig. 2 illustrates some of the *circuit* situations required to interface between CMOS and TTL devices. Ordinarily, a single low-power (74L) or low-power Schottky (74LS) TTL device can be directly driven from a CMOS output, *provided* that the CMOS device is operated from a +5-volt power supply and ground. Normally, CMOS devices can operate with ±V of ±4.5 to ±15 volts dc; furthermore, these supplies need not be equal. We could, for example, operate from V+ =5 volts, and V− =0 volts (grounded). It is only this latter situation that will accommodate Fig. 2(a). Here the CMOS device will directly drive the 74L or 74LS TTL device. These TTL devices operate from lower current levels than does regular TTL.

Two specific CMOS devices will directly drive a single regular TTL input: the 4001 quad two-input NOR gate and the 4002 dual four-input NOR gate. See Fig. 2(b). Note that the B series CMOS (4001B) would probably drive more than one input.

Fig. 2(c) shows the use of the 4049 or 4050 devices. These devices are hex inverter and hex non-inverting buffers, respectively. They are specially designed to directly drive up to two regular TTL inputs (output current of 3.2 mA) *provided* that the 4049/4050 package is operated from +5 volts and ground, rather than some other V+/V− combination.

In Fig. 2(d) we see that a TTL output will drive a CMOS input (actually, several can be accommodated) provided that there is a current source. Recall that the TTL output wants to see a 1.6-mA to 16-mA current source for its load, while the CMOS input is an extremely high impedance. In order to keep the TTL device operating properly, we must pro-

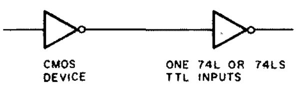


Fig. 2(a). CMOS-to-74L or -74LS devices.

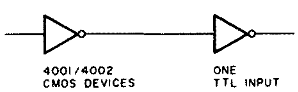


Fig. 2(b). 4001/4002 CMOS will drive one regular TTL load.

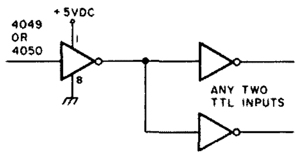


Fig. 2(c). 4049 and 4050 CMOS devices will drive up to two regular TTL loads.

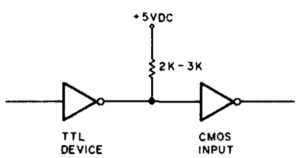


Fig. 2(d). TTL-to-CMOS (operated from +5 volt supply).

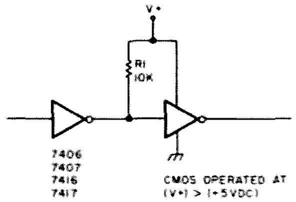


Fig. 2(e). TTL-to-CMOS (operated from V+ greater than +5 volts, and V− =0 volts).

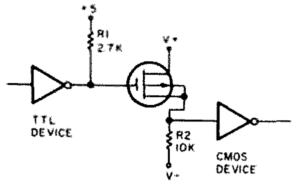


Fig. 2(f). TTL-to-CMOS (operated from ±V supplies).

vide a 2 to 3k-Ohm pull-up resistor between the TTL output and +5 volts dc. We must limit this method to those cases where the TTL voltage levels are compatible with the CMOS. If the CMOS device is operated from +5 volts and ground, then there is no problem.

Recall from the previous series on digital basics that the CMOS device output will go through a high/low or low/high transition when the input voltage is midway between the V+ and V− voltages. If, for example, the supplies are +5 volts and ground, then the transition occurs close to +2.5 volts. But, if the supplies are ±12 volts (or any other legal potential), then the transition occurs near zero. Similarly, if the potentials are V+ =12 volts and V− =6 volts, then the transition point is $\frac{1}{2}[(+12)-(-6)]=\frac{1}{2}(+18)$ or +9 volts. If this method were used in the latter case, the input of the CMOS device would jump back and forth between two "legal" low potentials, so the output

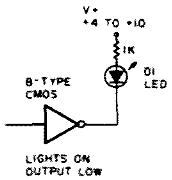


Fig. 3(a). CMOS light-on-output-low LED interfacing.

would never toggle. In Fig. 2(e) we show you how to deal with that problem.

For those cases where the CMOS device operates from power-supply potentials other than +5 volts and ground, we will need a circuit such as the one in Fig. 2(e). Here we will use one of the "high-voltage" hex inverter IC devices discussed at the beginning of this article: 7406, 7407, 7416, and 7417 are candidates; 7405 can operate only from +5 volts, so it is ruled out. Note that the package power-supply voltage for these TTL devices *must* remain at +5 volts only, but the voltage applied to the open-collector output transistor via the pull-up resistor can be up to the CMOS V+ limit of +15 volts dc. A 10k-Ohm pull-up resistor will suffice.

Fig. 2(f) shows how to interface the TTL device with CMOS devices that are operated from bipolar power supplies instead of V− = 0. In this circuit, we use a MOSFET transistor (or one section of the CMOS 4007 device) in between the two logic devices. Resistor R1 provides a current source for the TTL output, while R2 limits the MOSFET current to a safe value and develops the potential applied to the CMOS input. V+ and V− must be nearly equal.

Finally, in Fig. 2(g) we see a circuit that has a certain universality. In most cases,

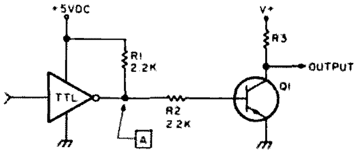


Fig. 2(g). Universal TTL to other logic devices.

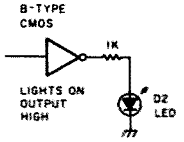


Fig. 3(b). CMOS light-on-output-high interfacing.

the function of this circuit will be to interface TTL to certain other higher-voltage logic families (such as CMOS operated from supplies over +5 volts, HNIL, HTL, etc.) In the majority of such instances, you will use a 7406, 7407, 7416, or 7417 device in place of transistor Q1, but this circuit may prove useful in some situations.

For example, in an existing device, there may be too little room to add an IC, but plenty of room to kludge on a 2N2222 or similar transistor. This situation turned up one time when I worked for a medical school electronics laboratory. It seems that one of the researchers had an elderly frequency/period counter that used zero and +12 volts as the logic levels, yet she wanted to interface this counter to a modern instrument that provided TTL output levels. The solution was to kludge R1–R3 and Q1 onto the PC board inside of the older instrument, and create a new input.

Register R1 is used, regardless of whether open-collector logic is used, and serves to provide a current for the TTL output to sink. When the TTL output is low, point A in Fig. 2(g) will be at zero potential, so the base of Q1 is turned off. Under this condition, the output is high (inverted). Similarly, when the output of the TTL device is high, the potential at point A is 3 to 4 volts, so it can bias the base of Q1 on. Under this condition, the transistor is saturated and will produce a low output. This method is useful so long as an inverted output is sufficient. Otherwise, cascade two similar stages. I

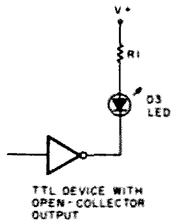


Fig. 3(c). TTL open-collector LED interfacing (circuit will also drive very-low-current lamps).

suspect, however, that any situation where cascading two Q1 stages is feasible will also permit the kludge of a 14-pin DIP, thereby making the use of the hex inverter the preferred method.

Interfacing Lamps and LEDs

Incandescent lamps and light-emitting diodes (LEDs) are often used in digital instruments to indicate logic status or to signal some event like the completion of a process, etc. The B series CMOS devices can often be interfaced directly with light-emitting diodes, provided that no more than about 15 mA of current will light the LED to an acceptable brightness (the usual case). The A series devices are not able to do this neat trick because they have as little as one-third the current sinking/sourcing capability of the B series devices.

Figs. 3(a) and (b) show the use of direct interfacing between a B series CMOS device and the low-current LED. The circuit in Fig. 3(a) uses the LED as a pull-up between the CMOS output and the positive power supply and will cause the LED to light on any output-low condition. The CMOS output in this case operates as a current source to ground. In Fig. 3(b), the LED is connected between the CMOS output and ground and will light only on output-high conditions. In this case, the CMOS output is used as a current source.

Fig. 3(c) shows the use of an open-collector TTL device to drive the LED. If V+

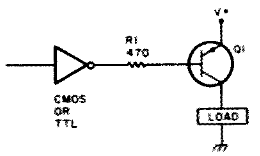
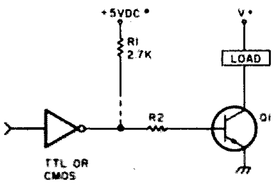


Fig. 3(d). Incandescent lamp interfacing with PNP transistor.



* OR V+ IF TTL IS 7406, 7407, 7416, OR 7417

Fig 3(e). Incandescent lamp interfacing with NPN transistor.

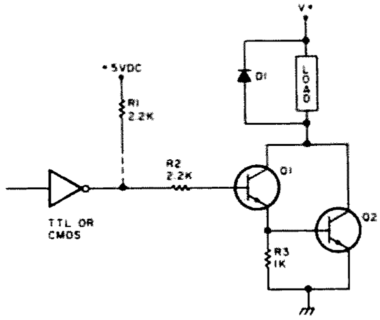


Fig. 4. Driving large loads using Darlington-pair transistors.

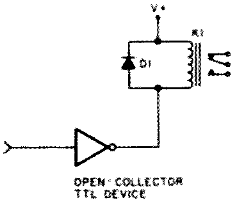


Fig. 5(a). Interfacing open-collector TTL to low-current relays.

is +5 volts, then the 7405 device may be used. The 7406, 7407, 7416, and 7417 devices may also be used at +5 volts or any potential up to the rated potential for the specific device (+15 or +30, depending upon type). Resistor R1 is used to limit the current through the LED and the TTL output to a safe value, usually 15 mA. The value of R1 is given by Ohm's law: $R1 = (V+)/I_{LED}$ or $V+/0.015$ if the 15-mA figure is acceptable. In this circuit, the TTL device operates as a current sink for the LED and will light on output-low.

Incandescent lamps typically draw a lot more current than LEDs. Some small current lamps ("grain-of-wheat" lamps) will operate directly from the 7417 TTL device, but most require too much current for safe operation directly from TTL. We can, however, use the TTL (or CMOS) device to drive a transistor switch that will, in turn, operate the lamp or other load. This situation is depicted in Figs. 3(d) and 3(e). In Fig. 3(d) we see the use of a PNP transistor to turn on the load. When the base of Q1 is made low, then the base-emitter potential is proper to turn on transistor Q1; current will flow in the c-e path to the load. If, however, the logic output is high, then the base-emitter voltage is nearly zero, so the transistor is cut off.

Fig. 3(e) shows the use of an NPN transistor for Q1. While the lamp in Fig. 3(d) will turn on for output-low, the circuit shown in Fig. 3(e) turns on for output-high. Again, either TTL or CMOS devices can be used, within certain limitations. One limitation applied to TTL devices is that a pull-up resistor (R1) be provided so that the TTL output sees a current source. For CMOS devices, we must use a transistor that has a high enough beta gain that it will saturate with the current available from the CMOS output. Resistor R2 is used to limit the current applied to the base of Q1. When the IC output is high, then a current flows in R2 that will turn on the transistor. Under that condition Q1 is saturated, so its collector will be at or near ground potential. This condition makes the load see a current flow, so if it is a lamp then it will light up.

Large loads, i.e., those of high current but limited voltage, can be accommodated with the circuit of Fig. 4. Here we extend Fig. 3(e) to account for the higher currents of the load. There are two transistors used in this circuit. In most cases, we will use a "driver" transistor such as the 2N3053 for Q1 and a "power" transistor such as the 2N3055 for Q2. Note that some semiconductor manufacturers offer TO-3 packages containing both Q1 and Q2 and term the combination "Darlington" transistors after the fact that the circuit in which these transistors are connected is called a "Darlington amplifier" or "Darlington pair."

The advantage of this circuit is the amplification of beta (H_{fe}) that occurs. The total beta is the product of the individual beta ratings, or: $H_{fe(total)} = H_{fe(Q1)} \times H_{fe(Q2)}$. If you recall your basic transistor theory, the beta is defined as the collector current divided by the base current, or I_c/I_b. For example, if the beta of Q1 is 80 and the beta of Q2 is 50, then the total beta is (80)(50) or 4,000. The implication of this is that the drive current need only be 1/4000 of the load current! Let's assume that there will be approximately 1.2 mA available to drive the Darlington pair when the TTL output is high. With a beta of 4000, the load current will be more than 4 Amperes! Of course, a transistor must be selected for Q2 that will "hack" the current of the load.

The diode shown in parallel with the load is advisable for all creative (capacitive or inductive) loads, and for most very high current loads. It is especially necessary in inductive-load circuits, for example, when the load is a relay or solenoid coil. The problem is the inductive spike produced by an inductor energized with dc when the circuit is interrupted. Under this circumstance, the energy stored in the magnetic field around the inductor will collapse and the counter-electromotive force generated will be opposite the polarity of V+ and will have a very high value (kilovolts are possible). If you have studied calculus, then you will see that $V = L(dI/dt)$ can reach a very high number in the situation where the current flow is abruptly terminated (dI/dt is negative and has a rapid fall time).

The diode is reverse-biased most of the time but will conduct when the CEMF potential is applied. Since the potential can easily reach hundreds of volts in practical situations, the diode must have a piv rating of 1000 volts or more. I recommend 1N4007 for all but very heavy inductive loads; for heavier cases, use series-connected 1N4007 devices with each diode shunted by a 470k-Ohm-to-1-megohm, ½-Watt, carbon resistor.

Fig. 5 shows two situations where electromechanical relays—those workhorses of electricity/electronics left over from the 19th century but still viable—are interfaced with digital IC devices.

In Fig. 5(a) we see the use of an open-collector TTL device for directly interfacing with a low-current relay. Some manufacturers offer low-current (40-mA and under) relays, both in regular relay packages and in packages resembling IC packages (both metal-can and DIP packages are available). Keep in mind the voltage and current limitations of the 7406, 7407, 7416, and 7417 devices listed at the beginning of this article.

For heavier relays, we will

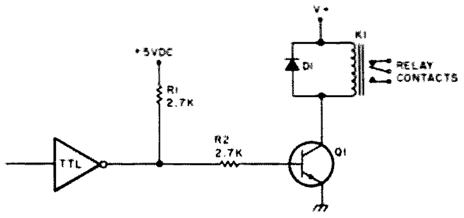


Fig 5(b). Interfacing TTL or CMOS to higher-current relays.

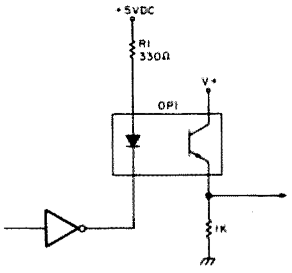


Fig. 6. Driving an isolated load.

use a switching transistor, as in Fig. 5(b). This is merely an extension of the earlier circuits. The diode transient suppressors are mandatory, however. If these are not used, especially in Fig. 5(a), the high voltage transient will blow the semiconductor.

Relays are used for many applications. Of course, if the current is too high to be conveniently handled by the semiconductor, then a relay is in order. But, today, we have numerous high-current power transistors and Darlington devices, so this application is fading. The isolation provided by the relay, however, makes it attractive whenever the logic device must be interfaced with a high-voltage circuit, or the ac power lines (115 volts ac).

Finally, we see one further method for providing isolation between a digital circuit and some outside-world load. There are devices called *optoisolators* (Fig. 6) available in which an LED and either a phototransistor or a photodiode are placed such that the LED will illuminate the transistor/diode (whichever). The pair is housed inside of an opaque DIP package that has the same 0.1" × 0.3" pinouts as the digital IC devices in the circuit. When the LED is turned on, i.e., when the logic device output is low, then the phototransistor base is illuminated, so the transistor is turned on. Under this condition, the output will be a potential close to V+. When the LED is extinguished, i.e., when the logic output is high, then the phototransistor base is turned off and there will be no voltage across the load resistor. In most cases, the dangerous isolated circuit will be on the transistor side of the optoisolator. In some cases, however, the dangerous side of the circuit will *send* the signal and thus will be on the LED side.

Conclusion

The advantages of digital logic are even greater when we can interface either between logic families or to the outside world. The techniques in this article allow us, among other things, to interface elderly digital equipment obtained on the surplus market to modern equipment, or to interface essentially non-digital circuits (control) that are still binary in nature to some digital instrument. For example, a trivial case would be the push-to-talk circuit on a transmitter. As another example, the transmitter control circuit on a linear power amplifier could be placed under control of a computer in which the digital interfacing is between a 3.2 mA (fan-out = 2) output port terminal and the radio equipment. Lots of luck. ■

Calvin B. McCarthy
98 Windsor Street
Thunder Bay, Ontario
Canada P7B 1T7

Emulate an EPROM Elephant

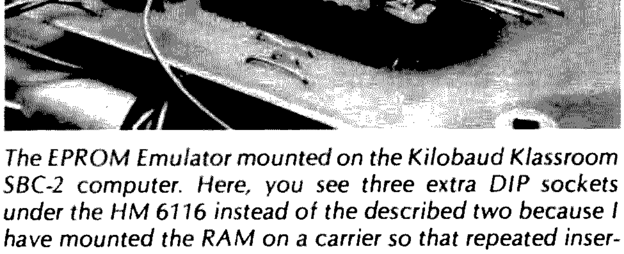
The portable RAM-faker never forgets. Well, hardly ever. . .

Members of the 2716 family of erasable, programmable, read-only memories (EPROMs) are extolled as the hobbyist's friends because of their ease of programming, either with a simple manual programmer or by microcomputer control. However, in the literature also appears a recurring theme of inconvenience. For example, you could spend four or five hours toggling in data with a manual programmer only to make a mistake in bit 16,383. What is the fix? Erase all 16,384 bits of the EPROM and begin again. Totally unacceptable! Even repeating 20 minutes of data input with a hexadecimal keyboard is too much!

Or maybe instead you eventually want a program in an EPROM but you want to try the program first before it is burned for posterity. The "EPROM Emulator," a RAM that pretends it is an EPROM, can help you.

The HM 6116 static RAM is almost pinout-compatible with the 2716 EPROM. Where the HM 6116 puts the WE on pin 21, the 2716 has Vcc pulling pin 21 high. All other pins are identical. This first suggests that empty EPROM sockets could be filled with 2K bytes of RAM to extend a small computer's memory. From here the CMOS construction makes the idea of battery backup of RAM data practical. Then the next logical step is to build a small package containing RAM with battery backup which can be programmed at full computer speed, data modified at will, but which can be removed from its socket without losing its data, placed in another socket in the same or any other computer wired for 2716 EPROMs, and used as an EPROM. Once the program is debugged and running satisfactorily in the Emulator, it can easily be copied into a 2716 for a permanent record.

A few simple modifications are made to the basic RAM circuit to make it emulate the EPROM. The Vcc must be applied through steering diodes so that the memory will see only one supply source at a time. Output enable (pin 20) is made continually low by at-



The EPROM Emulator mounted on the Kilobaud Klassroom SBC-2 computer. Here, you see three extra DIP sockets under the HM 6116 instead of the described two because I have mounted the RAM on a carrier so that repeated insertions will not hurt the RAM pins. I then can use the memory without the Emulator circuit most of the time.

Parts List

- 1 Switch, DPDT, Radio Shack 275-626 ($2.69)
- 2 Diodes, 1N914, Radio Shack 276-1620 (50 for $2.99)
- 1 Resistor, 100k Ohms, ¼ Watt (5 for $.49)
- 2 24-pin DIP sockets, Radio Shack 276-1989 ($1.69 each)
- 1 HM 6116 CMOS static RAM ($16.50 Quest; $14.95 James)
- 2 Batteries, 1½ volt

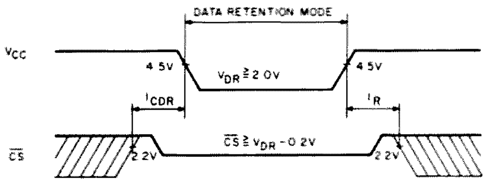


Fig. 1. Low Vcc data-retention waveform.

taching it directly to pin 12 and disconnecting it from computer pin 20. The low Vcc data-retention mode needs the chip select held at Vcc to retain the data. This is achieved with a pull-up resistor connected to memory pin 24 and a switch to disconnect the $\overline{CS}$ from external circuitry when in the data-retention mode. To enable the computer to write to memory, pin 21 is disconnected from the computer and brought out to a clip lead so that pin 21 can be connected to the computer $\overline{WE}$ line instead of being forced to Vcc in the 2716 socket. When used as a 2716, the $\overline{WE}$ line is attached to Vcc so that accidental and catastrophic writes do not occur.

These connections can be made using a small PC board to hold the components and using wire-wrap wire to make connections. I use masking tape as a PC board etch resist and cut away the tape where copper is to be removed. This is quite satisfactory for simple circuits such as this. The board then is epoxied between the pins of the bottom DIP socket and makes a secure foundation for the rest of the circuit. The components are attached to the copper side of the board facing up. Some miniaturization enthusiast could even find a way to store watch batteries in the case to make a one-box unit, although I am using an external battery pack.

To use the Emulator, I insert it into a 2716 EPROM socket with the switch set to battery supply. (It must never be inserted into the computer with the computer supply off if the switch is in the computer-supply position. The result would be a quickly-discharged battery.) The computer is then turned on and the Emulator switched to computer power. It can then be used either as RAM or ROM depending on the $\overline{WE}$ connection.

Construction

The EPROM Emulator is built on two 24-pin DIP sockets and a small PC board. This serves as the support for the HM 6116 RAM package.

1) Pin 20 of the bottom socket is removed.
2) Pin 20 ($\overline{OE}$) of the top socket is connected with a piece of wire to pin 12, the common pin.
3) Pin 18 ($\overline{CS}$) of the top socket is bent in so that no contact is made with the bottom socket. It is connected through a resistor to pin 24 of the top socket and through half of the DPST switch to pin 18 of the bottom socket.
4) Pin 21 of the bottom socket is removed.
5) Pin 21 of the top socket is connected to the computer $\overline{WE}$ line with a flexible wire and clip.
6) Pin 24 of the top socket is bent in and made to contact the PC board land to which the diode cathodes are connected.
7) Pin 24 of the bottom socket is connected to the anode of diode D1 to provide computer Vcc.
8) The second half of the DPST switch is connected across diode D1.

With the switches closed, the computer Vcc powers the memory and allows the computer to select the

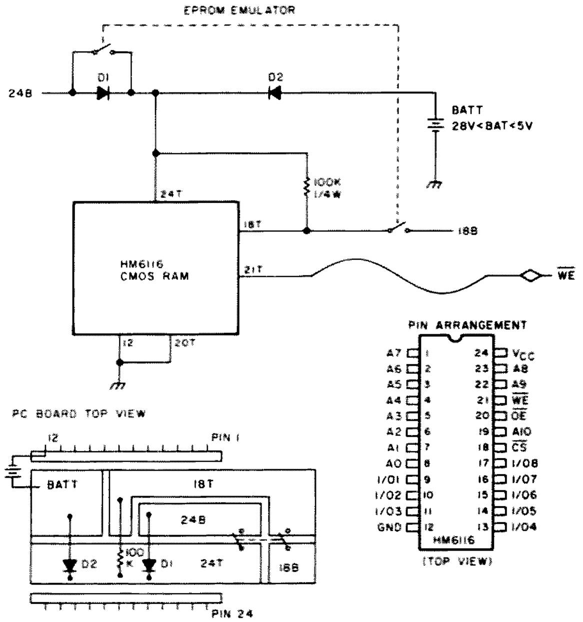


Fig. 2. The Emulator schematic. PC board is not to scale. Letters after pin numbers are B for bottom socket, T for top socket.

RAM for either a write or read. With the switch open, the battery backup can power the memory and forces $\overline{CS}$ to be at Vcc backup, putting the chip into its low Vcc data-retention mode. ■

See List of Advertisers on page 130

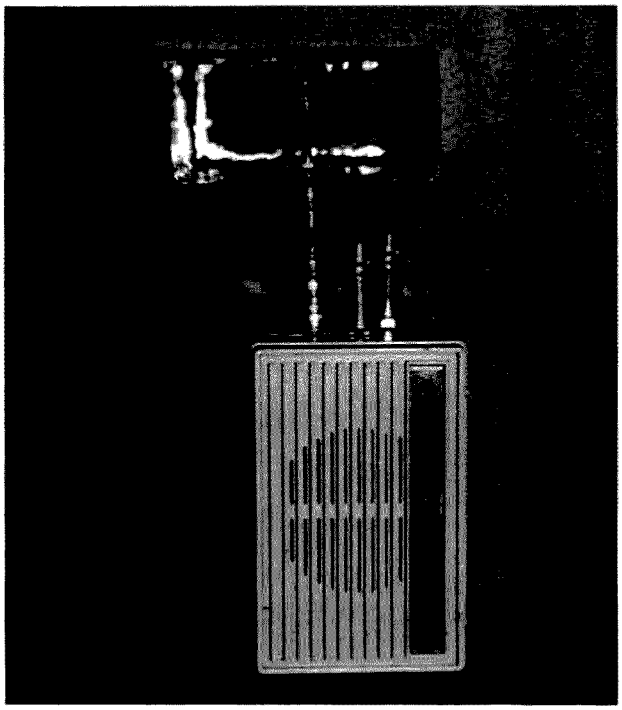
John M. Franke WA4WDL
1310 Bolling Avenue
Norfolk VA 23508

Crystal Microwave

"Easedropping" on this part of the spectrum is up to you. Here's a simple way to start.

Interest in the microwave spectrum has increased rapidly since the introduction of the "Gunnplexer" by Microwave Associates. Many amateurs, though, have expressed interest in finding a more economical way to get started. What I hope to accomplish with this article is to show how to get involved in microwaves with a minimum investment of time and money.

The microwave spectrum is populated with myriads of signals, ranging from telephone relays to television-studio links to radar to satellite signals. How can we detect and monitor these signals? The simplest way is with a crystal receiver. Don't scoff. I know of several production microwave systems that use crystal detectors or crystal video receivers as they are called. The common police radar detector is a special type of crystal video receiver.



Front view of S-band unit showing diode placement.

A crystal receiver can be broken down into four basic parts: an antenna, a tuned circuit, the detector, and an amplifier (see Fig. 1). The most common tuned circuit is not really a tuned circuit but a high-pass filter, a waveguide. In this mode, the antenna and tuned circuit can be combined. If the detector is mounted in the waveguide, then the only external component is the amplifier.

Rectangular waveguide will pass all frequencies above a cutoff frequency (f_c). The cutoff frequency is determined by the internal width dimension of the waveguide. The cutoff frequency occurs when the internal width is exactly one-half wavelength. A simple formula for calculating this is $f_c = 15/b$, where b = internal width in centimeters and f_c = cutoff frequency in GHz. For example, the most common waveguide for the 3-cm amateur band (10 GHz) has an internal width of 0.9 inches or 2.29 cm. Hence, $f_c = 6.55$ GHz.

If the frequency is raised such that the width is now one wavelength, the guide can support another mode. This occurs at $f = 2f_c$. So, the maximum stable frequency range is from f_c to $2f_c$. Well, if you consider skin losses and other factors, the practical frequency range is

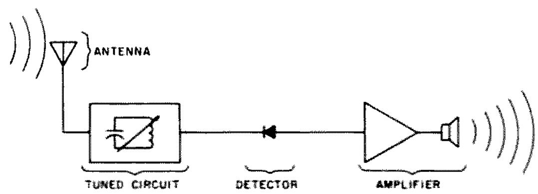


Fig. 1. Basic elements of a crystal video receiver.

from 1.25 f_c to 1.9 f_c. For the previous example, the practical or useful frequency range is 8.19 GHz to 12.44 GHz. This is in good agreement with the published range of 8.2 GHz to 12.4 GHz. Fig. 2 is a graph of the upper and lower practical frequency range of rectangular waveguides having internal widths from 2 cm to 18 cm.

The graph is not meant just to enable you to determine the frequency range of a piece of surplus waveguide. It will also enable you to decide how wide to make a piece to use. Yes, you can make your own waveguide and do it without a machine shop. Waveguide can be made from flashing copper, brass shim stock, or, my favorite, printed circuit board. To illustrate, I made a crystal video receiver to monitor several radars located near my home.

There are three S-band search radars within 20 miles of my home. The term S-band refers roughly to any frequency between 1.5 GHz and 5 GHz. Table 1 is a listing of these informal designations. Table 2 is a listing of some microwave frequency ranges of interest. The local search radars are grouped from 2.7 GHz to 2.9 GHz.

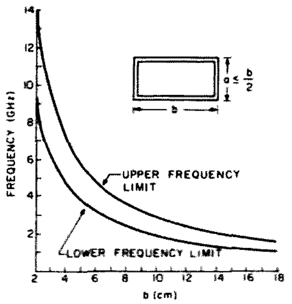
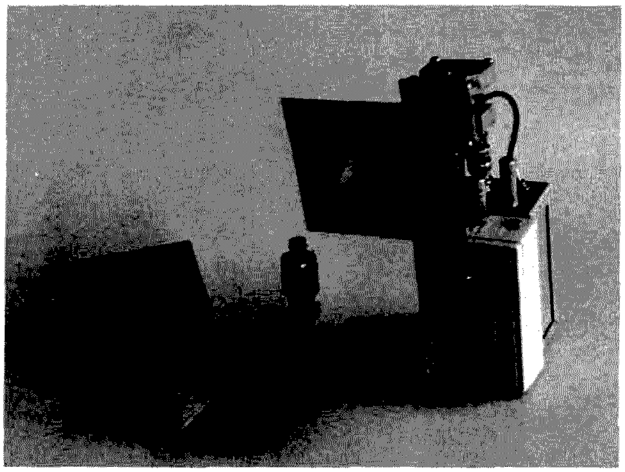


Fig. 2. Upper and lower frequencies shown for rectangular waveguides.

Hence, from Fig. 2, the waveguide should have an internal width between 6.9 cm and 9.5 cm. I chose 8 cm as a compromise. The internal height should be one half or less than the internal width. The guide height determines the impedance and power-handling capability of the guide. The useful frequency range of the 8-cm guide is approximately 2.4 GHz to 3.6 GHz. This range just happens to include the amateur 2400-MHz and 3300-MHz bands. Higher frequencies can travel or propagate down the guide, but the mode structure would be uncertain. I mention this because the guide will pass X-band signals and you should not be surprised to hear them.

For a crystal receiver, I prefer to make the guide 1 to 2 widths long. For the example, the guide is 9.5 cm or 1.125 widths long. This length was chosen on the basis of available pieces of circuit board. Since the receiver will not be used for a specific frequency but rather for a band, I mounted the BNC connector and detector one-half guidewidth from the shorted end.



Detector/amplifier with X-band head and nearby S- and K-band heads.

Construction is simple. The circuit board material is easily sawed or sheared to size. The BNC mounting holes and the opposing diode hole are drilled next. The guide is taped together and the seams are soldered with a 100-/150-W iron. After assembly, the diode is placed inside and soldered. No bypass capacitor is used. I find that normal construction techniques are adequate to block the microwave energy and pass only the modulation. Surplus mixers have a very efficient bypass scheme and function well as crystal receivers. I use an X-band mixer to monitor small marine radars in the harbor.

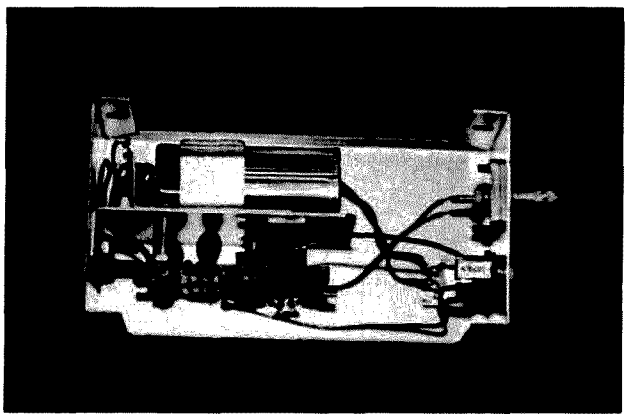
The weak detected signal is boosted by the amplifier shown in Fig. 3. An LM301 is used instead of the more common 741 because of the lower noise output of the LM301. The output of the amplifier is further boosted by Radio Shack's "Mini Amplifier-Speaker." The low current drain of the amplifier makes it inviting to obtain its power from the mini amplifier, but problems with

Band Designation	Freq. Range (GHz)
P	.2- .4
L	.4- 1.5
S	1.5- 5.0
C	4.0- 6.5
X	5.0-12.0
K	12.0-36.0
Q	36.0-45.0
V	45.0-60.0

Table 1. Microwave band designations.

Source/Emitter	Freq. Range (GHz)
ILS Glideslope	.3286-.3354
TACAN-DME	.96-1.215
Radar Beacons (IFF)	1.03, 1.09
Air Route Radar	1.3-1.35
Airport Radar	2.7-2.9
Aircraft Doppler Radar	8.8
Precision Approach Radar	9.0-9.2
Marine Radar	9.3-9.5

Table 2. Selected emitter frequencies.



Internal view of preamplifier showing circuit card and battery.

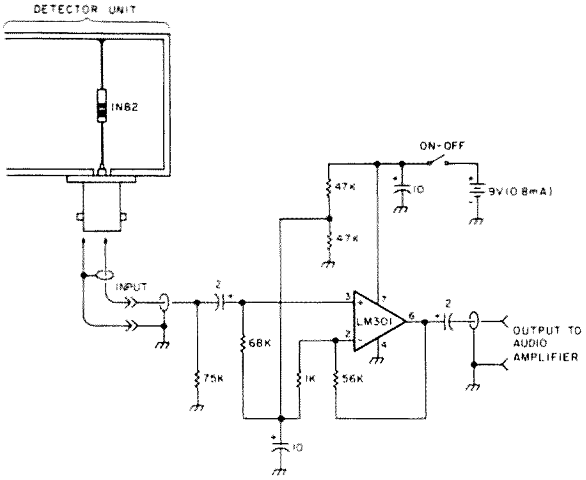


Fig. 3. Schematic of a 50× audio preamplifier.

motorboating forced me to use an independent battery. The compact assembly is quite portable and accompanies me on short outings.

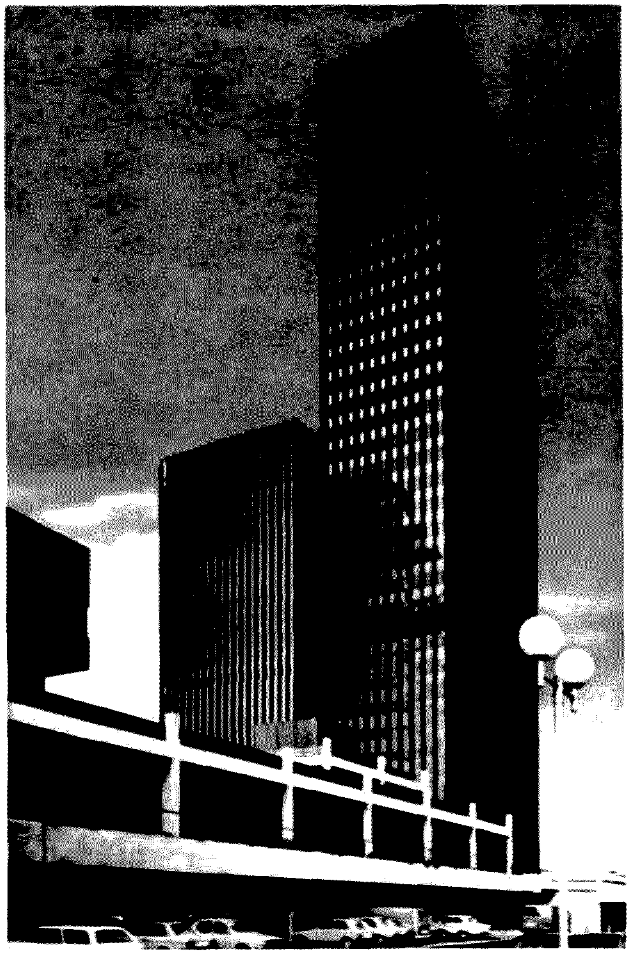
Waveguides are not the only usable form of crystal receivers. For narrowband signals, a separate antenna, tuned circuit or cavity, and detector might be better. Preamplifiers, if available, greatly enhance the overall sensitivity.

Try something simple and build one of these. This might be the easiest microwave construction article yet. Let me know what you build and how it worked, and please remember to enclose an SASE! ■

Take a Trip to Europe

These tips from the world's top SWL make it possible.

Roger N. Peterson
25 Orchard Lane
New Canaan CT 06840



The programs you hear from West Germany emanate from this brand-new Broadcasting Center of Deutsche Welle in Cologne.

Want to visit a ski resort in Switzerland? Listen to a concert in Vienna or the Scots Guard's Band on parade in London? Or go behind the Iron Curtain to hear the latest word from the Kremlin?

You can experience all of these and much more by tuning to the European shortwave broadcasters. With more than thirty stations daily sending out broadcasts in English, you have a wide variety of programs to choose from. And most are heard easily on even the most modest receivers here in North America.

The majority of these stations are state-owned and/or operated and all but one are noncommercial. Some—particularly those located in Eastern Europe—can fill your ears with propaganda, but even some of these broadcasters can offer good programs to listen to. Others, like the BBC from London, Radio Netherlands, and the Swiss Broadcasting Corporation, produce a multitude of excellent programs every week with practically no political undertones.

With so many stations and programs to choose from, you should easily be able to discover some of particular interest to you.

Are you interested in programs giving the latest DX news? There are some good ones coming out of Europe every week. The best is probably from Radio Netherlands, where every Thursday night they broadcast the popular *Media Network*. The producer, Jonathan Marks, talks with a network of correspondents in various parts of the world, examining developments in the electronic media on both the technical and the programming side. In addition to reporting changes in broadcasting frequencies by stations all over the world, *Media Network* does an excellent job of keeping listeners informed about new receivers, antennas, and other equipment for the shortwave enthusiast. Hear this on 9.590 or 6.165 MHz at 0230 GMT and 9.715 and 6.165 MHz at 0530 GMT Fridays.

Another excellent DX program comes from Switzerland—*The Shortwave Merry-Go-Round*. This features the "two Bobs," Bob Thomann and Bob Zannotti. This team answers letters with technical questions, reports on new developments in antennas and receivers, and carries on lively discussions about the state of the art. This program is on twice each month—on the 2nd

and 4th Saturdays. Hear it at 1315 GMT on 21.570 or 25.780 MHz.

Radio Sweden International brings you another fine DX program, *Sweden Calling DXers*. This is on every Tuesday and Wednesday and gives you a whole list of new or changing frequencies for stations all over the world. It is one of the best for keeping your "where to tune to" list up to date. Hear it Tuesdays at 1415 GMT on 21.615 MHz or at 2315 GMT on 9.695 and 11.705 MHz, and on Wednesdays at 0245 GMT on 9.695 and 11.705 MHz.

Radio Sofia from Bulgaria is the one broadcaster from behind the Iron Curtain that is worthwhile listening to for its DX program. It is particularly good for radio amateurs, giving club news from around the world and holding contests. You can hear it on Mondays at 0045 GMT on 9.700 MHz.

There are some nine or ten other DX programs coming out of Europe, but at this writing, the ones mentioned above are by far the best. Belgium has a nice little program on Mondays at 0045 GMT on 11.695 or 9.870, and Austria has an excellent program on Sunday mornings at 1230 GMT on 21.615 MHz.

The Spanish Foreign Radio from Madrid broadcasts a number of frequency changes and other DX matters on Mondays at 0050 on 11.880. Reception is usually excellent here in North America. And Radio Prague from Czechoslovakia has a DX show that features news and information for radio amateurs. It is very elementary, however, and most listeners won't gain much knowledge from its usual fare. The program is on Fridays at 0135 GMT, on 5.930 or 9.630 MHz.

World and local news are popular with experienced European shortwave broadcast listeners. Almost every station broadcasts news, usually at the start of their programs. Some attempt to cover the world while others tend to stay strictly with news of their own countries or sections of Europe.

The leader in news programs, by a wide margin, is the British Broadcasting Corporation (BBC). They broadcast more than 250 news programs a day from their London headquarters. News is fed to their editors from BBC correspondents located all over the world, and from their world-famous Monitoring Service which provides round-the-clock reports on what foreign broadcasters are saying over the air. This service is so popular that the BBC sells it to subscribers—other foreign broadcasters, governments, news agencies, etc.

You can hear world news in English from the BBC 16 times a day. It is broadcast on the hour except for the GMT hours of 0100, 1000, 1200, 1400, 1500, 1900, 2100, and 2200. If you are interested in local Great Britain news, listen daily at 0009, 0309, 1109, and 1809 GMT, and, on weekends, also at 0709 GMT.

The BBC has many other news-related and special-news programs such as British Press Review, Financial News, etc. A BBC buff could spend 24 hours a day listening to their programs, many of them about current affairs.

The other European stations that broadcast world news are West Germany, Radio Netherlands, Swiss Radio, Spanish Foreign Radio, Radio Portugal, Belgium, Austria, and a whole slew of Iron Curtain broadcasters. Few people would bother to tune to these stations for

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Radio Sofia
Bulgarian Dragan Cankov 4
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Finland
Radio Finland
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Radio France Internationale
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Paris 16

Germany (West)
Deutsche Welle
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D-5000
Koln 1
Federal Republic of Germany

Germany (East)
Radio Berlin International
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German Democratic Republic

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London WC2B 4PH

Greece
Voice of Greece
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Oslo

Poland
Radio Polonia
Komitet do Spraw Radia 1 Telewizji
ul Woronicza 17, 00-950
Warszawa

Portugal
External Relations
Av. Engl Duarte Pacheco, 5
1000 Lisboa

Romania
Radio Bucharest
PO Box 1-111
Bucuresti

Spain
Radio Nacional De Espana, SA
Apartado 150.039
Madrid 24

Sweden
Radio Sweden International
S-105 10
Stockholm

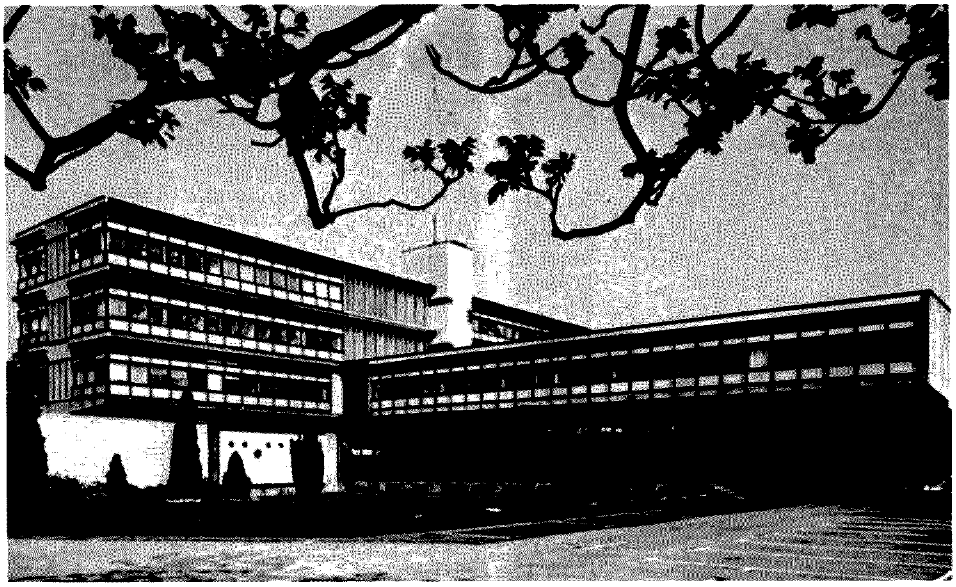
Switzerland
Swiss Radio International
Giacomettistrasse 1
CH 3000
Bern 15

U.S.S.R.
Radio Moscow
Pyatnitskaja ulitza 25
Moscow

Radio Kiev
Radio Center
Kiev
Ukraine

Vatican
Vatican Radio
Vatican City
Rome

Yugoslavia
External Broadcasting
2 Hildendarskaa
Beograd



These modern broadcasting facilities of Radio Netherlands at Hilversum, Holland, bring you some of the best English-language programs from Europe.

their world news alone as, for the most part, they are not in the same league as the BBC. There are, however, occasions when it does pay to tune to one of these countries. Those would be when particular news events take place in that country or area: earthquakes, revolutions, invasions, big fires, etc. This is when shortwave listening really comes into its own. You can get the story firsthand and often before the international wire services get it to your local AM radio or TV newscasters.

Some European shortwave stations skip world news entirely and stick to reporting localized news. The Scandinavian broadcasters are good examples. Rather than try to compete with the BBC for world news reporting, Radio Sweden broadcasts news only about that country. The Norwegians and Finns do likewise. (The Danes do not broadcast any English language programs, so I have no idea how they report the news.)

You can, of course, get local news from the stations that also broadcast world news, but often, as is the case with the BBC, it comes in separate and distinct programs such as the daily "News About Britain" and the weekly "Letter from London" programs.

Listeners to Europe generally either concentrate on a few select stations or on certain types of programs that appear on a number of different stations. It all depends on the listener's background or interests. If family ties are to a certain country or if travel or being stationed there during time in the service generates interest, these may be reasons for listening. Other listeners stumble onto certain stations as they tune around the frequencies and find that certain programs grow on them.

Most of the European stations try to broadcast to the US in so-called "prime time." This is the period between 0000 GMT and 0430 GMT. This is to catch the maximum number of listeners in their evening hours. Many stations will have two broadcasts of the same program, one at the earlier hour to catch East Coast listeners and the other at the later time to pick up the West Coast.

There are exceptions, like Radio Finland, which directs its broadcasts to North America only in the mornings. And some of the "powerhouses" like Radio Moscow and the BBC can be heard at almost any time.

A recent survey among shortwave listeners indicated their favorite broadcasters. The question simply asked, "What is your favorite shortwave broadcast station?" The results, in order of popularity, were as follows for European stations:

1) BBC
2) Radio Netherlands
3) Swiss Radio
4) Deutsche Welle (W. Germany)
5) Spanish Radio
6) Austrian Radio
7) Radio Moscow
8) Radio Finland
9) Vatican Radio
10) Radio Sweden
11) Radio France International

Your choice may be different. If you haven't listened to European broadcasters lately, here in alphabetical order are brief outlines of what you can expect to hear from each. See table for best frequencies and times of broadcasts.

● *ALBANIA (Radio Tirana)* —Unless you have some special interest in this country, this station is not likely to become one of your favorites. Mostly political discussions.

● *AUSTRIA (Austrian Radio)* —One of the better stations to listen to. You can hear it every night with news followed by a feature program. Additionally, Mondays are for answers to listeners' letters, Tuesdays are for sports, Fridays have music, and Sundays feature tourist attractions. This station is presently upgrading its transmitting equipment and should be easier to receive in the months ahead.

● *BELGIUM (BRT)*—Has the usual news programs first and then various features, many dealing with the European Common Market which is headquartered in Brussels. You can hear their DX program on Mondays at 0100 GMT.

● *BULGARIA (Radio Sofia)* —Their best program is their DX news on Mondays at 0045 GMT. The rest is pretty much "party line" discussions of politics.

● *CZECHOSLOVAKIA (Radio Prague)*—Many listeners feel that this is the best of the Iron Curtain broadcasters. While it has its share of political discussions, it also has a number of interesting shows that are free from that taint.

● *FINLAND (Radio Finland)* —This is one you catch in the morning hours, and reception is usually good. They start with news about Scandinavia called *The Northern Report* and then switch over to various feature programs, including pop music.

● *FRANCE (Radio France International)*—You can hear this one only in the early afternoon hours, and then you are listening to their broadcast to Africa—the only program they offer in the English language. Much of their programming is devoted to listeners' interests in Africa, such as Third World countries. Rumors persist that RFI will increase En-

glish programming, but so far this is all they offer.

● *E. GERMANY (Radio Berlin International)*—A typical "Iron Curtain" country broadcaster. Lots of news, all with political implications.

● *W. GERMANY (Deutsche Welle)*—Excellent news broadcasts and interesting current-events discussions. If you like music, listen on Saturday evenings. Want to learn German? They have a language course on Sundays.

● *GREAT BRITAIN (BBC)*—Besides news and current events, this station offers a whole slew of other programs including both jazz and concert music, short stories, and dramas. One of their most popular programs originates here in the US where Alistair Cooke tapes his *Letter from America*. There is something for everyone during the 24 hours of broadcasting by this station.

● *GREECE (Voice of Greece)*—Probably will be of interest only to those with special ties to the country or area. Can be interesting when one of the frequent quarrels with Turkey comes up or Cyprus erupts.

● *HUNGARY (Radio Budapest)*—Sometimes, but not often, you can hear an interesting program. I would rank it about in the middle as far as Iron Curtain SW broadcasters go.

● *ITALY (RAI)*—If you are a lover of music, this is the station for you. They have opera, Italian folk music, and "pops." Also, programs on other aspects of Italian culture and life. One of the better European stations.

● *LUXEMBOURG (RTL)*—This is a rare one, a commercial station that you can hear from Europe. It beams its programs to London, and you can hear commercials like those on a US AM or FM station. The programs are all "mod" music.

● *MALTA (Xandir Malta)*—This little station is heard only once a week, on Saturdays, and at an impossible hour for most of us here in North America (0700-0800 GMT). Not much to recommend, but if you can't sleep some Friday night, give it a try.

● *MONACO (TWR Monte Carlo)*—Another one with very late hours for North American listeners. This is a religious station and the programs are all in that mode.

● *NETHERLANDS (Radio Netherlands)*—Many fine programs to hear on this popular European station. On Sundays, host Tom Meyer has the *Happy Station* show. Mondays feature life in Holland. Tuesdays is *Shortwave Feedback* which answers listeners' letters. On Wednesdays listen to *Dutch Spot* on a magazine-format program about events in Holland. Thursday is devoted to that very popular DX program, *Media Net-*

work. Friday features *Opinion* and discusses some of the views of the Dutch press. Saturday is a light program with talk and music; it is pleasant listening all the way.

● *NORWAY (Radio Norway)*—This is one you have to catch on Sundays since that is the only time they broadcast. Some good programs for people interested in traveling there some day and also interested in good music.

● *POLAND (Radio Polonia)*—Not the best of reception for most of its programs. But then the programs aren't anything to write home about, anyway.

● *PORTUGAL (Radio Portugal)*—Their first program isn't on until 0300 which makes it pretty late for East Coast listeners. While their programs are not particularly earth-shattering, it is a pleasant station to listen to and most programs are non-political.

● *ROMANIA (Radio Bucharest)*—Has some interesting programs. *DX Mailbag* is on Wednesdays, and other DX programs are on Mondays and Fridays. Tuesdays they have a very interesting *Tourist News* program that makes you want to visit the country. Interested in stamp collecting? Tune in on Sundays for a special program on this hobby.

● *SPAIN (Spanish Foreign Radio)*—Another one of the top European broadcasters providing good listening on most nights. Reception is consistently good, too. Their DX program is on Mondays at 0050 GMT.

● *SWEDEN (Radio Sweden)*—Another good one from Europe. Aside from their DX program, already mentioned, they have a very fine program on the weekend called *Saturday from Stockholm.*

● *SWITZERLAND (SRI)*—One of the most popular of all from Europe. While their weekday programs, primarily news and background, are good, their weekend programs are superior. On the second and fourth Saturdays, listen to their popular DX programs—among the best on the air. On Sundays they have a new program called *Balance Sheet.* This is about Swiss business. Don't think, however, that it is dry statistical reporting. Instead, it is a very lively description of Swiss industry. Recently, for example, they had a very interesting program on the Swiss chocolate industry. Another one brought us up to date on clocks and watches.

● *USSR (Radio Moscow and Radio Kiev)*—Many people listen to Radio Moscow just to hear their viewpoint on world affairs, US diplomatic steps, etc. One of their most popular programs is called *Listeners' Forum* and you can hear this on Sundays at 0010. Right after this comes *Russian by Radio,* if you have any interest in learning to speak their language. Another good program is *Round about the USSR,* heard on Tuesdays and Saturdays at 0210 and 0510.

Radio Kiev is preferred by many people over Radio Moscow. Weekdays provide the usual news followed by feature programs—most political. They have a DX program on Wednesdays which is pretty good, but perhaps their best program is on Sundays when you can hear *Music from the Ukraine.*

● *VATICAN (Vatican Radio)*—You can hear it every evening, even though it is on for only 16 minutes. Programs express Vatican opinions on current events and other matters.

● *YUGOSLAVIA (Radio Yugoslavia)*—Strictly news, and all handpicked for political implications.

So there you have it. There is a wonderful choice of programs from Europe in English just waiting for you to tune in. Most are easily heard and offer you entertainment, education and/or enlightenment. With your shortwave receiver, you can travel to Europe every day. ■

William C. Cloninger, Jr. K3OF
4409 Buckthorn Court
Rockville MD 20853

Four Bands, One Whip

Quadruple your mobile operating pleasure, please, but don't blame us.

Did you ever want to change bands while operating mobile but didn't want to stop in the rain to change resonators? Now you can change bands without a thought about your mobile antenna. How about a bandwidth as much as one megahertz (see Fig. 8), with swr of no more than 1.5:1? You can build this mobile antenna for a fraction of the cost of a commercial mobile antenna. The materials are readily available and are not costly.

A Look at the Basics

The six-foot mast is constructed from ½" copper water pipe. The overall length is not critical, but signal reception will suffer at anything much less than a five-foot mast length. If you own a Hustler or similar mast, you already have the first part of your new multiband mobile antenna.

Multibanding is obtained by the use of multiple LC circuits—one for each band desired. A typical mobile antenna has resonators (LC circuits) with an adjustable whip. The adjustable whip is actually the C of the resonant LC circuit. You might think of such a mobile antenna as shown in Fig. 1.

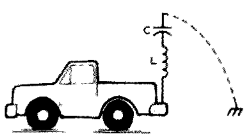


Fig. 1. Top-loaded mobile antenna.

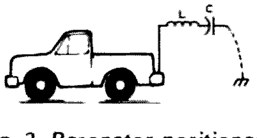


Fig. 2. Resonator positioned at 90° (vertical polarization retained).

Adjusting the whip changes the C and raises or lowers the resonant frequency. A tip: In general, a greater amount of capacitance will result in a greater bandwidth. These mobile antennas are "top-loaded," i.e., the LC circuit is at the top of the antenna and, for all practical purposes, the only part of the antenna that radiates is that portion *below* the resonator. That is the reason you should make the mast as long as is practical. Since the whip is basically C, why stick it up in the air where it will just give your antenna increased ability to reach all those nearby objects—trees, carports, etc.? You can actually place a typical resonator at a 90° angle to the mast and probably notice no difference in performance, although tuning may change slightly. This could present an eye hazard or you might even spear a bird. Let's look at this change as shown in Fig. 2.

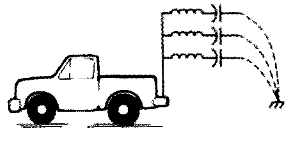


Fig. 3. Multiband antenna setup.

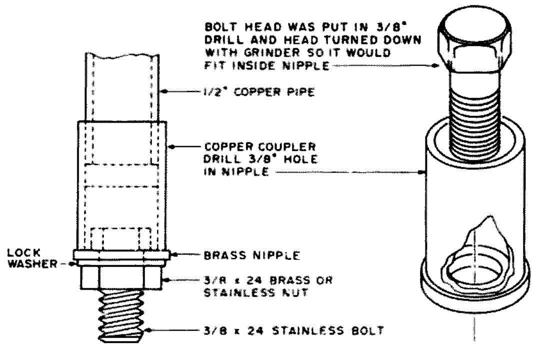


Fig. 4. Mast-to-mobile attachment.

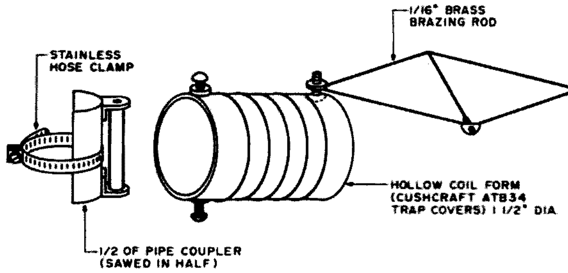


Fig. 5. Details of mounting bracket.

Capacitance does not have to come in the form of a whip. Two wires in the shape of a V form a capacitor proportional to the area within the V. The V is easy to adjust (change C). In fact, I used exactly this method in my initial experiments. It doesn't work too well for actual mobile use because the V is not rigid during vehicle motion and the vibration of the V causes fairly wide and constant changes in resonance.

Now that I had decided to place the LC in a horizontal position, I also decided to multiband the antenna by using more than one LC circuit. The configuration now becomes that shown in Fig. 3.

I am currently using four LC circuits on my mobile antenna, but you can use one, two, three, four, or more. I haven't tried five yet, but that's one of the next steps. The LC for the lowest frequency should be at the top of the mast with the next higher frequency below that and so on.

Mechanical Construction

The idea for the mast came from an article in *73 Magazine* (February, 1979, p. 42). I used non-ferrous materials to avoid any rust problems. The mast itself is a six-foot length of ½" copper water pipe. The details of the fitting which attaches the mast to your mobile mount are shown in Fig. 4. I used a brass end cap through which I drilled a 3/8" hole for the 3/8" × 24 stainless steel bolt. The brass end cap is considerably stronger than the copper end cap used in the *73 Magazine* article. However, it does require that the head of the bolt be reduced to allow it to fit in the inner diameter of the brass end cap. I simply chucked the 3/8" × 24 bolt in my 3/8" electric drill and used my shop grinder on the bolt head while letting the drill rotate the bolt for a nice even "machining." The end cap is assembled with a bronze or stainless steel lock washer and a brass or stainless steel nut. If you have any difficulty in finding a stainless steel bolt, you might try a local boat or marine dealer.

The end cap is assembled to the mast with an ordinary copper sleeve and soldered with a propane torch. Do a good job here because there is a lot of force at the base of the mast. I use a rigid mount and do not tie or guy my antenna. Now we close the end of the mast to keep out water. I soldered a flat piece of copper to the end of the mast.

LC Construction

I used some spare trap covers from my Cushcraft HF antenna for the supporting structure for the inductor and capacitor. These trap covers are thin and do not offer much wind resistance as the wind flows through them. They are probably a phenolic material, which is very suitable for an inductor form.

The part which kept me from building the antenna for over a year (I love to procrastinate) was deciding how to fasten the LC circuits to the mast. Fig. 5 and Photo A show the construction details of the mounting bracket. I cut a copper sleeve in half longitudinally and brazed copper tabs to the half coupling. Copper for the tabs was obtained by splitting a short length of copper pipe, opening it up, and flattening it with a hammer. (I had four feet of copper pipe left after cutting six feet off for the mast, so the material was handy.) The tabs were bent 90° and a piece of ¼" copper tubing was brazed between the 90° tabs so that the inductor form would not be crushed when attaching it to the bracket. Brass nuts, 6" × 32, were soldered to the top and bottom of the bracket. You might want to use one long screw to attach the whole assembly and not be bothered with the brass nuts.

A word about brazing the copper parts: The high heat anneals the copper. It becomes soft and I have had one bracket fail due to the vibration. It lasted over eight months and over 20,000 miles. The 15-meter LC was made with #12 copper wire and was quite heavy. You might solder or silver solder your bracket or find an even better method of attaching the LC assembly to the mast.

I have made inductors using #12, #18, and #20 wire. The #12 wire is quite heavy for a 20-meter LC circuit and probably impractical for a 40-meter LC circuit. The #20 wire gets warm when using a steady carrier but has caused no problem with SSB. If you run a kilowatt mobile, the #12 wire should do just fine.

The capacitance was added by using 1/16" brass welding rods. I chose the modified rhombic because it did

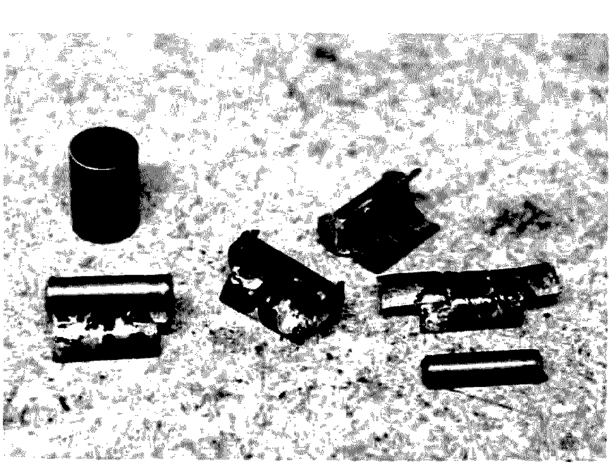


Photo A. Disassembled mounting bracket.

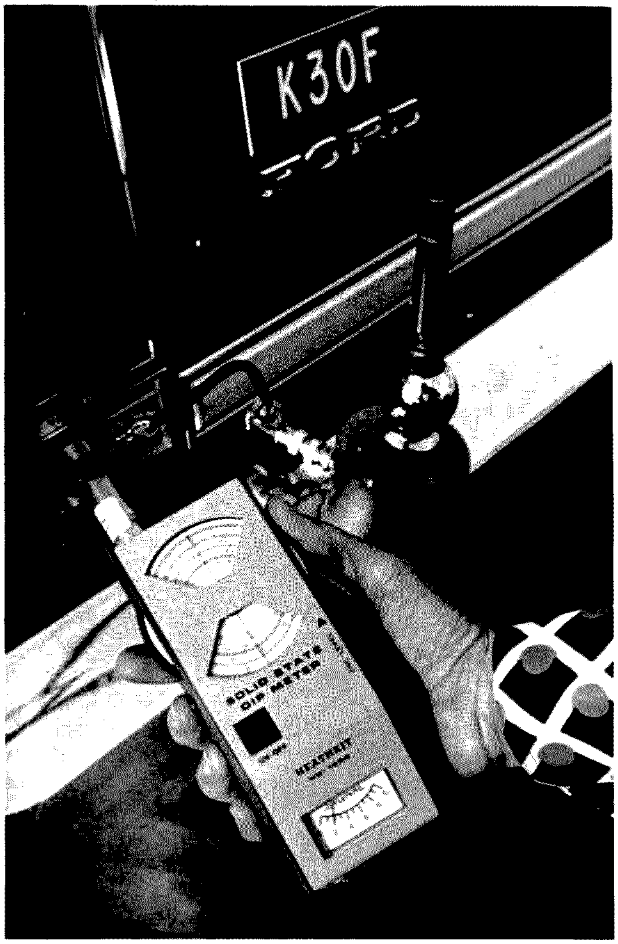


Photo B. Grid-dip meter position.

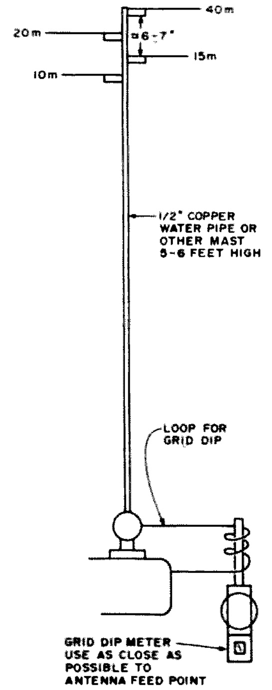


Fig. 6. Grid-dip meter positioning.

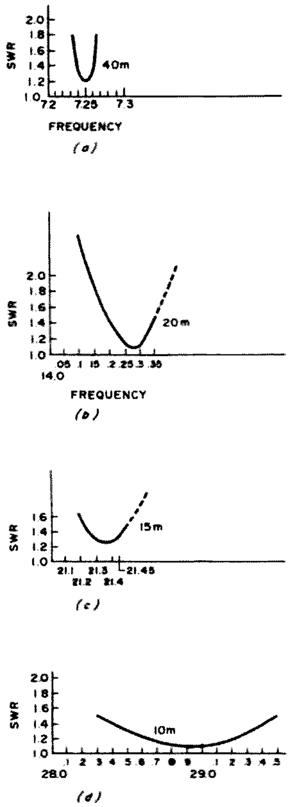


Fig. 8. Typical swr and bandwidth. (a) 40m swr (approx. 25 kHz @ 1.5 or less swr). (b) 20m swr (approx. 150 kHz @ 1.5 or less swr). (c) 15m swr (approx. 300 kHz @ 1.5 or less swr). (d) 10m swr (approx. 1.3 MHz @ 1.5 or less swr).

not have a sharp end as would a V and should avoid some static problems. I had hoped to adjust the C by bending the rhombic (increasing or decreasing its area). I found that vibration and vehicle motion caused erratic changes in resonance, so I added the adjustment spanner to the center of the rhombic. This allows easy adjustment of the resonant frequency.

Determining LC Values

If you like to experiment by trial and error, you'll love this. I spent many hours removing one turn at time, varying capacitance, and trying to find where the LC was resonant. I would be looking for a 15-meter or 20-meter resonance and would all of a sudden find myself in the 10-meter range. This is not the best way to start, although you will probably have to use this cut and try method for the 10-meter LC.

I found that I could use my Heathkit® grip-dip oscillator (gdo) to find the resonant frequency of the LC. The secret is to put a pickup coil at the base of the antenna and insert the gdo coil inside the coil (see Photo B). The Heathkit gdo is a handy piece of equipment but hardly a laboratory-grade instrument. I first found a resonant frequency of 14.2 MHz, so I connected the antenna to the transmitter and checked swr. It was not resonant anywhere in the 20-meter band! Suspecting something funny, I used the same pickup coil and connected it to my frequency counter and, since a gdo is actually a signal generator, the counter showed that the indicated 14.2 MHz was actually 13.8 MHz. It was convenient that the error was on the low side because I had to remove only one turn to raise the frequency of the LC circuit (or decrease capacitance, which would not be as desirable as it would reduce bandwidth). You don't need a frequency counter to check your gdo. Just use a short antenna on your HF rig and sweep the frequency with the gdo until you hear its signal on your HF receiver. This is an easy method to calibrate or compensate your gdo.

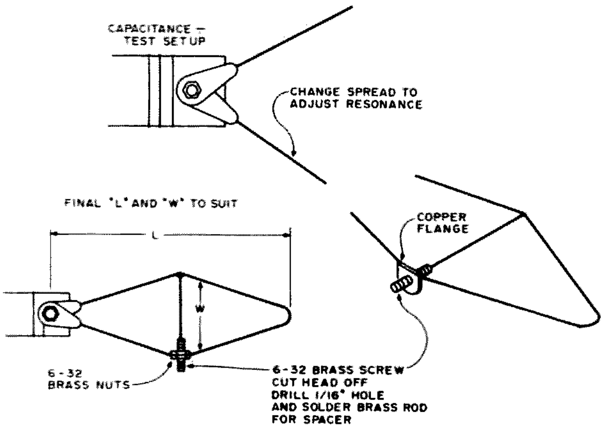


Fig. 7. Resonance adjustment assembly. Inductance—any diameter, any wire size (to suit power level), number of turns to suit frequency.

1-19/32"-Diameter Inductor Forms

	Band	# Turns	L x W
#12 Wire	20m	32	10" 2-1/8"
	15m	16	11-1/4" 1-3/8"
	10m	11	9-1/4" 1-1/8"
#20 Wire	40m	55	14-1/4" 1-1/2"
	20m	22-1/2	13-1/4" 1-1/2"

Additional data using #20 wire

92 turns = 5.5 MHz
83 turns = 5.9 MHz
67 turns = 6.6 MHz
62 turns = 6.8 MHz
59 turns = 7.1 MHz
55 turns = 7.25 MHz
38.5 turns = 11 MHz

Note: L and W are the length and width of the rhombic (C).

Table 1. Inductor winding data.

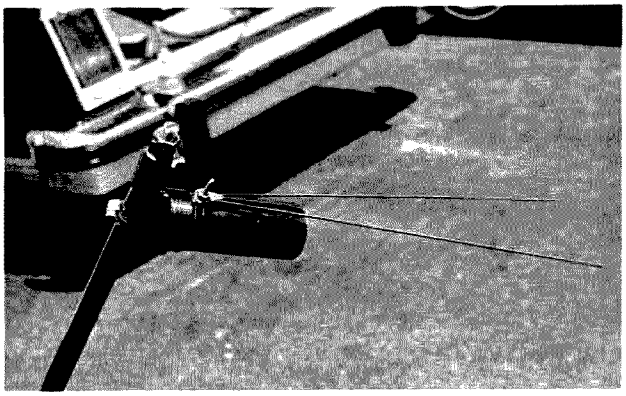


Photo C. Resonator test assembly.

As previously mentioned, I used a V configuration (Photo C) for the initial capacitance as it could be easily changed to adjust the resonant frequency. Work on one LC circuit at a time. Table 1 gives some dimensions which are intended to be a guide and give you a place from which to start. Differences in form diameter, wire size, and materials will require that you find your own right combination.

Weatherproof

Your LC assembly must be weatherproof. I learned from experience what a little rain will do to the resonant frequency. I guess I just figured out why commercial antennas use trap covers! My first attempt at weatherproofing was by dipping the LC assembly in polyurethane varnish. This lowers the resonant frequency about 500 kHz and is heavy. I have used epoxy resin, the type used to make fiberglass repairs, with good results. There is no appreciable frequency change; it is tough, medium in weight, easy to apply (pipe cleaners make excellent disposable paint brushes), and cures in about 30 minutes.

My preferred method is to put some silicone seal at the end of the LC assembly and enclose the inductor in heat-shrink tubing (obtained surplus or at a hamfest, in case you don't know how much a piece of new 2"-diameter heat-shrink tubing costs!).

Assembly and Adjustment

When you have completed the desired number of LC assemblies, they are attached using stainless steel worm-type hose clamps. The LC assemblies should be positioned fore and aft very carefully to minimize wind resistance. They should be carefully aligned or you may have one big rudder and a very "mobile" antenna. I have used care in alignment and have watched the antenna at highway speeds—it does not whip around. Proper positioning may actually create a stabilizing effect.

Fig. 6 shows the positioning I am presently using. There is some interaction between the LC assemblies, and "four in a row" caused some swr problems, particularly on 15 meters.

Adjust each LC circuit to the frequency you desire. Start with the highest frequency first (10 meters) and adjust each until you have adjusted the LC circuit of your lowest band.

More Thoughts

You don't have to make a multiband antenna. You may make an LC assembly for only one band. It might be used on a four-foot mast when height is a consideration such as on a motor home or tractor-trailer. You might combine two or more LC circuits on a single inductor form. You might use a circle instead of a rhombic for capacitance. You might leave the circle or rhombic open at the end and adjust the spread with a movable insulator. You might use a ferrite core to reduce the size of the inductor. You might use the LC assemblies for a temporary or space-restricted base antenna (with proper radials or counterpoise). You might build a small beam or rotating shortened dipole. You might . . .

Thanks to Bo Owen K4QKH, senior staff engineer at Teledyne Avionics in Charlottesville, Virginia, for the fundamentals and basic ideas.

CU on 10 . . . or 15 . . . or 20 . . . or 40 . . . or . . . ■

✓See List of Advertisers on page 130

The Conlog Solution

What's the key to winning contests? Put an Atari and this program at the helm of your station and find out.

Charles D. Moore N5ATD
PSC #2 Box 3000
Elmendorf AK 99504

This program enables a radio operator to keep a more accurate contest log. It fits quite handily into a 16K Atari 400/800, yet will save and compare up to 750 callsigns. The information can be saved or recalled to/from disk or cassette and output to the screen or a printer. A callsign can be compared with up to 750 others in slightly less than one second.

I never really intended to write this program. But the rest of you hackers out there will recognize the symptoms. At the request of a friend, I tried to translate a short program written in Microsoft Basic to Atari Basic. But, after adding a little bit here and a "Hey, this would be nice" there, it grew into the present monster. Well, maybe not a monster, but certainly more than I intended.

As usual, the hardest part of translating to Atari Basic is the string handling. In Atari Basic, strings cannot be directly dimensioned into arrays. Instead, DIM A$ (1000) sets aside 1000 spaces for one long string. While in some ways not being able to dimension a string array is more difficult, having a single long string is in other ways very fast and controllable. I made a single string 9000 characters long and sort of partitioned it off into segments of 12 characters each (12 * 750 = 9000). By taking, for example, the seventh callsign and multiplying it by 12, the 84th through 95th characters in A$ can be accessed by A$(84,95). In other words, for N=7, A$(N*12,N*12+11). The subroutine to search CALL$, the string that holds all the callsigns, is a machine-language subroutine loaded into page six by line 445. The subroutine searches the length of CALL$ for a match to the current entry using X= USR(XX). This is accomplished in lines 160 through 170. The variable GOOD is used to count the number of good contacts. I used GRAPHICS MODE 2 because the letters were bigger and I could throw in a little color without using up room needed for string space by taking advantage of the additional colors available in MODE 2 with inverse letters, lowercase letters, and inverse lowercase letters. The sound is simple, but I found that anything more elaborate tended to slow down the program a great deal. If a callsign is good (it has not been encountered before), a high tone is sounded. A bad callsign will result in a low tone. This way the operator cannot tell if an entry is good without looking at the screen.

Operating Conlog

First of all, type in the program. It helps, believe me. Hopefully, upon RUN, the screen will display the number of stations worked, zero at this point. In the text window, two lines of information are displayed in inverse video. The first merely reminds you that no more than 12 characters may be made on each entry; the program will ignore any extra. The second line gives the functions. To access these instead of a callsign, type: SCREEN for output to the screen, PRINTER for an output to the printer, or MENU for saving or loading information. The output to the screen is pretty quick but may be stopped and restarted by CNTL 1 at any time. The output to the printer is one callsign per line because I was running out of program space. Now you are ready to enter a callsign. Upon typing one in and RETURN, the program will print the callsign in the box and then search the string CALL$ for a duplication. A message, GOOD or WORKED, will be printed below the callsign in the box.

If at any time you desire to save or load information, use MENU and follow the questions you will be asked. First, you will be asked if you are using disk or cassette. Just press the first letter, D or C. If you are using disk, you will be asked for a file name. Follow the general guidelines for a file name given in the Atari Basic reference manual. Next, a message SAVE LOAD QUIT will be printed. When you press S or L, you will be asked to ready the device you are using. Q will return to the callsign entry portion. Now, if you operate on a band and want to change

```
10 REM CONTEST LOG-Charles Moore  N5ATD
15 GRAPHICS 2
20 GOSUB 445:GOOD=0
25 DIM CALL$(9010),C$(12),TEST$(12),HOLD$(12),FILE$(14),D$(14)
30 FOR Z=1 TO 40:CALL$(Z,Z)=" ":NEXT Z
35 TRAP 65:CLOSE #1
40 POSITION 0,2:? #6;"input callsign:";
45 POSITION 1,5:? #6;"******************";
50 POSITION 1,6:? #6;"*                *";
55 POSITION 1,7:? #6;"*                *";
60 POSITION 1,8:? #6;"******************";
65 POSITION 0,0:? #6;"WORKED=";GOOD
70 ? " ";
75 IF GOOD=0 THEN CALL$="":C$=""
80 IF GOOD=750 THEN 255
85 ? "maximum entry: 12 char":? "SCREEN  PRINTER  MENU"
90 INPUT C$:IF LEN(C$)=0 THEN 70
95 HOLD$="            "
100 HOLD$(1,LEN(C$))=C$(1,LEN(C$))
105 POSITION 3,6:? #6;"             ";
110 POSITION 3,7:? #6;"          ";
115 ? " ";
120 POSITION 3,6
125 ? #6;C$;
130 IF C$="SCREEN" THEN 335
135 IF C$="MENU" THEN 255
140 IF C$="PRINTER" THEN 415
145 IF GOOD=0 THEN GOSUB 250:GOTO 65
150 GOSUB 155:GOTO 65
155 C$(LEN(C$)+1)=" "
160 LY=LEN(CALL$):LX=LEN(C$):POKE 207,LX-1
165 B=LY-LX-1+3
170 A=USR(1664,ADR(CALL$(1)),ADR(C$),B)
175 IF A=0 THEN 190
180 POSITION 3,7:? #6;"WorKeD";:S=230:GOTO 240
185 IF HOLD$(1,12)=CALL$(LEN(CALL$)-11,LEN(CALL$)) THEN 500
190 POSITION 3,7:? #6;"GooD!!";
195 S=50
200 ? " ";"ADD TO LIST (Y/N)";:OPEN #1,4,0,"K:":SOUND 0,122,14,1
205 GET #1,T:CLOSE #1:? " ":SOUND 0,0,0,0:IF CHR$(T)="Y" THEN 220
210 IF CHR$(T)="N" THEN 85
215 GOTO 200
220 GOOD=GOOD+1
225 CS=12*GOOD+1
230 CALL$(CS,CS+11)="            "
235 CALL$(CS,CS+11)=HOLD$(1,12)
240 FOR Z=1 TO 50:SOUND 0,S,10,10:NEXT Z:SOUND 0,0,0,0
245 RETURN
250 CALL$(1,12)=HOLD$(1,12):GOTO 505
255 GRAPHICS 0:CLOSE #1:TRAP 255
260 GOTO 280
265 ? "INPUT FILE NAME  ex: 'BAND10'":?
270 INPUT FILE$:IF LEN(FILE$)=0 THEN 265
275 RETURN
280 D$="              "
285 OPEN #1,4,0,"K:"
290 ? " DISK  OR  CASS":GET #1,Z
295 IF Z=68 THEN GOSUB 265:D$(1,2)="D:":GOTO 510
300 IF Z=67 THEN D$(1,2)="C:":GOTO 310
305 GOTO 255
310 ? " ":? " SAVE LOAD QUIT":GET #1,Z
315 IF Z=81 THEN GRAPHICS 2:GOTO 35
320 IF Z=83 THEN CLOSE #1:GOSUB 435:OPEN #1,8,0,D$:GOTO 375
325 IF Z=76 THEN CLOSE #1:GOSUB 435:OPEN #1,4,0,D$:GOTO 400
330 GOTO 255
335 IF GOOD=0 THEN GRAPHICS 2:GOTO 35
340 C=-1:R=0
345 GRAPHICS 0:FOR Z=0 TO GOOD-1:CS=12*Z+1
350 C=C+1:IF C=2 THEN R=R+1:C=0:IF R=23 THEN R=0
355 TEST$=CALL$(CS,CS+11):POSITION C*20+4,R
360 ? TEST$:NEXT Z
365 ? CALL$(LEN(CALL$)-11,LEN(CALL$))
370 FOR Z=1 TO 1000:NEXT Z:GRAPHICS 2:GOTO 35
375 IF GOOD=0 THEN ? "NOTHING TO SAVE":FOR Z=1 TO 1000:NEXT Z:GOTO 35
380 PRINT #1,GOOD
385 FOR Z=0 TO GOOD-1:CS=12*Z+1
390 TEST$=CALL$(CS,CS+11):? #1;TEST$:NEXT Z
395 TEST$=CALL$(LEN(CALL$)-11,LEN(CALL$)):? #1;TEST$:CLOSE #1:RUN
400 GOOD=0:INPUT #1,GOOD:FOR Z=0 TO GOOD:CS=12*Z+1
405 INPUT #1,TEST$:CALL$(CS,CS+11)=TEST$(1,12)
410 NEXT Z:GRAPHICS 2:GOTO 35
415 OPEN #1,8,0,"P:":FOR Z=0 TO GOOD-1:CS=12*Z+1
420 TEST$=CALL$(CS,CS+11):? #1;TEST$:NEXT Z
425 ? #1;CALL$(LEN(CALL$)-11,LEN(CALL$))
430 CLOSE #1:GRAPHICS 2:GOTO 35
435 ? " ":? "PREPARE DISK/CASSETTE":? :? "PRESS RETURN"
440 INPUT TEST$:RETURN
445 FOR I=1664 TO 1755:READ A:POKE I,A:NEXT I:RETURN
450 DATA 104,104,133,204,104,133,203,104,133
455 DATA 206,104,133,205,104,141,222,6,104
460 DATA 141,221,6,169,1,133,212,169,0,133
465 DATA 213,160,255,200,177,203,209,205
470 DATA 240,40,24,165,203,105,1,133,203
475 DATA 165,204,105,0,133,204,24,165,212
480 DATA 105,1,133,212,165,213,105,0,133
485 DATA 213,205,222,6,208,216,165,212,205
490 DATA 221,6,208,209,240,7,152,197,207,208
495 DATA 204,240,6,169,0,133,212,133,213,96
500 POSITION 5,7:? #6;"WoRkEd";:S=230:GOTO 240
505 S=150:GOOD=GOOD+1:POSITION 5,7:? #6;"GooD";:GOTO 240
510 D$(3,LEN(FILE$)+3)=FILE$(1,LEN(FILE$)):GOTO 310
```

Program listing.

bands for a while because conditions change, you can dump the information to disk or cassette and easily start again later by calling up prior callsigns by file name. This can lead to a few less headaches and improved eyesight.

Notes

Unfortunately, there was very little room left for remarks, so they are rather sparse in the listing. If you are using disk, you of course have more than 16K, so it would be easy to expand the number of entries. When you save the information, be sure you have plenty of room, as 750 entries takes about 75 sectors on a disk and a correspondingly great amount of cassette space.

This program is designed as a help for contest logging, but it could be used to check for duplicate entries for just about anything. With minor effort, the string partitions could be shortened or lengthened. Likewise, the graphics could easily be changed to fit a specific application. The substring search would only need to be changed so that the new length of the substring is used for comparison.

I hope this program will make all the users of other than Atari Basic jealous. It runs quickly and looks nice. With the small blend of machine language, the program makes a nice addition to the ham's computer library. If you really mess up and break the program, you can restart it by GR.2:GOTO 35 and nothing will be lost or affected. If you have any comments, questions, or (hopefully) improvements, please let me know. I'll answer/comment on anything with an SASE. Also, if you would like a copy of this program, just send a blank disk or cassette with a stamped, self-addressed mailer and $3.00 to PSC #2 Box 3000, Elmendorf AK 99504.

Credit Department

I learned the technique used for the substring search from a very good article by E. C. Smith in the August, 1982, issue of *Compute* magazine. My Basic version of the same type of search took about 13 seconds to compare 750 entries. ■

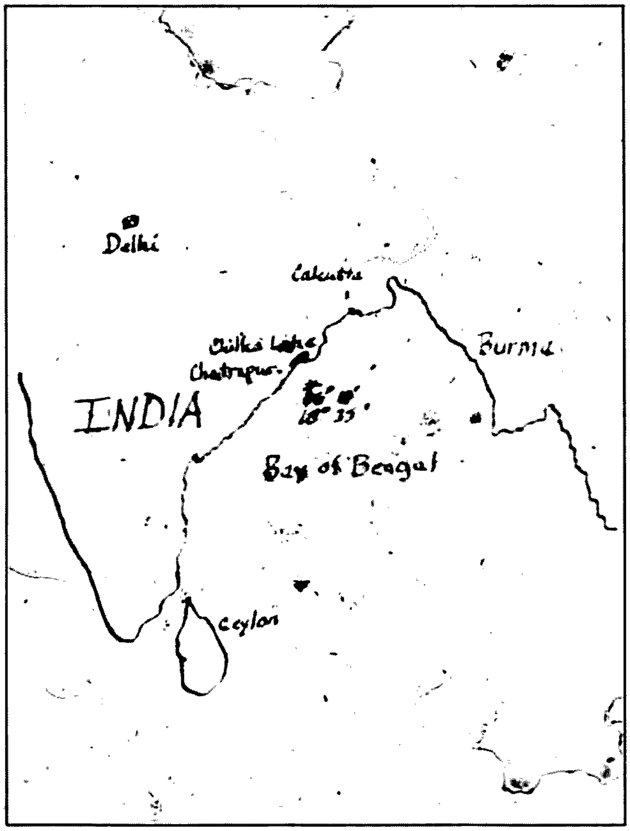
Spenser Whipple, Jr.
c/o 73

Ishmod's Journal

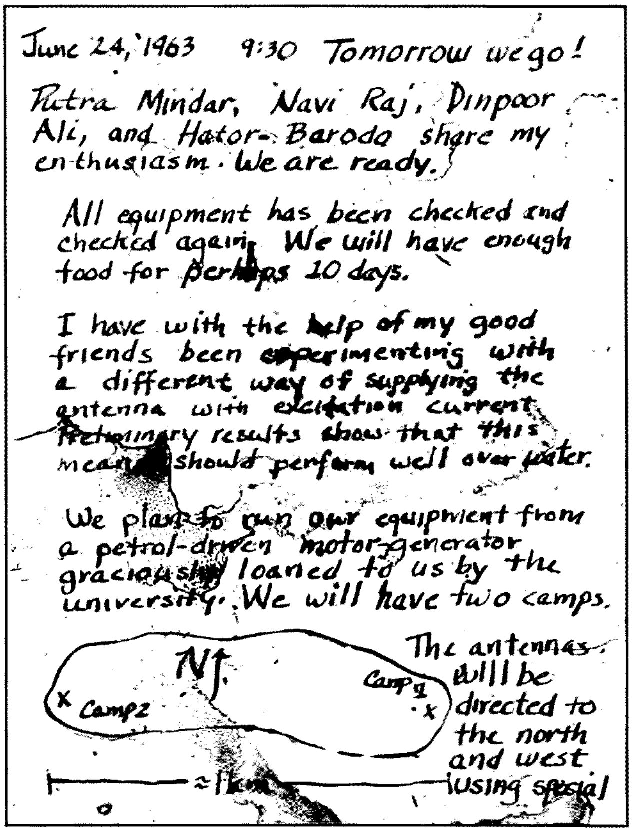
What happened in 1963 finally surfaced in 1983. Was he a fool?

It all started out innocently enough. Planning a DXpedition to an area that was thought to be in the control of one of the Balkan States. But what a story. I had agreed with Ishmod that the story would not be told until he was gone. He believed that the telling of his story would provide him with a great deal of money and power and he wanted nothing but to be left alone.

It began in early July in 1967. My wife and I had spent a relaxing holiday on Capri. On our way back to Athens she wanted to do some more shopping, so we looked for a locker at the train station to temporarily store some of our packages. When I opened it, a crumpled paper bag was in it. Curious as to its contents, I looked inside. A strangely familiar sequence of letters and numbers caught my eye on the front of an old leather-bound notebook—



Map page from the Ishmod Journal. The map is hand-drawn and centers around the Bay of Bengal and the tiny speck of land that was to be the DXpedition's destination. Water damage has obliterated the coordinates of the island and other critical parts of the puzzle.



June 24, 1963 9:30 Tomorrow we go!

Putra Mindar, Navi Raj, Dinpoor Ali, and Hator-Baroda share my enthusiasm. We are ready.

All equipment has been checked and checked again. We will have enough food for perhaps 10 days.

I have with the help of my good friends been experimenting with a different way of supplying the antenna with excitation current. Preliminary results show that this means should perform well over water.

We plan to run our equipment from a petrol-driven motor-generator graciously loaned to us by the university. We will have two camps.

The antennas will be directed to the north and west using special

Another loose page from the journal. These entries were made the night before Ishmod and his friends were ferried to the island.

what turned out to be what I would later call the Ishmod Journal

Unaware of its historic importance, I tucked the ragged notebook under my arm, figuring I would take a quick look at it while my wife made still another of her forays into the local shops. So, when I did look at the cover again, it dawned on me why the faded legend on the cover seemed familiar. It read S7Z2B. That could well be an amateur-radio callsign, although I had no idea to which country it might have belonged. Settling under an olive tree, I began to read. When my wife came back about 40 minutes later, she thought I was crazy from too much sun. I was babbling about someone named Ishmod and that the world had to know about him. So this is Ishmod's story, at least as well as I could put it together. I say that because there still are some areas that can't be accurately put together.

Though the handwriting was poor and some of the pages were damaged from moisture, I think I figured out most of it. I do wonder, though, because most of it, if I interpreted it correctly, is almost too much to believe. Hams around the world have had some wonderful and disastrous DXpeditions, but this one takes the cake. And through an incredibly intricate string of events, the story has remained hidden all these years. A novel could be based on the travels of the journal itself.

It seemed that Ishmod Kaduk S7Z2B, an amateur-radio operator from the Indian state of Sikkim, had gathered a group of fellow hams from two neighboring villages to share in his dream of putting a new prefix on the air. Ishmod had intended to use a barren rocky footprint of land about 70 miles off the coast of India in the Bay of Bengal. The exact location is hard to determine as this information was on one of the pages damaged by water, but it appeared to be southeast of Chilka Lake, which is about 200 air miles from Calcutta, down the eastern coast of India.

Apparently, Ishmod was an experienced sailor, having grown up in Chatrapur, a small village near Chilka Lake and the sea. He had spent his boyhood there until he went off to the university at Delhi. This much was clear.

One summer after his next to last exams in what was to lead him to the equivalent of an electrical engineering degree, he had packed his small sturdy sailboat with enough provisions for a week and was planning a relaxing cruise in the familiar bay. Three days out, he saw something ahead in the water. There was no land indicated on any of his charts, but there it was. Using a sextant, he noted his position and resumed his vacation from his studies.

When he returned to school in Delhi, he spent some time in the great libraries and government record buildings looking for some reference to the small island he had found the previous summer. Having grown up in that area and sailed there all his life, he could not recall any mention of the land from the sailors he used to talk with down on the dock near his village.

Eventually, he did find an old document at the Indian Registry of Vessels that warned ship captains of the menace of a reported shoal at about the location he had seen the rocky island. The document also noted that "landing rights thereon" had been claimed over a hundred years ago by a Serbo-Croation prince through some special diplomatic agreement. Although claimed by the prince, the landfall had not become the legal territory of any country. Ishmod could not believe what he read. The following summer he planned to have his DXpedition. And this was the beginning of the adventure chronicled in the Ishmod Journal.

Late in the evening on June 24, 1963, Ishmod and four other hams sat around a small table on the dock at Chatrapur, double-checking their equipment lists. They had pooled their money and chartered the only boat large enough to ferry their equipment and provisions to the rocky island that was to be home for the next six days. Little did they know then that they were about to make history. They were to be the first to observe a phenomenon that defied the laws of physics and electromagnetism. The rocks of the island exhibited the incredible capacity to alter the infundib-

Continued on page 224

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5592 S. Moore Street
Littleton CO 80127

The Terminal Terminal Unit

Build this variable-shift TU. Its performance will knock you dead.

Following the advent of the affordable home computer, increased interest in RTTY operation was generated in the amateur community. The benefits of being able to do away with the noisy printer and use video displays for received and transmitted data moved this mode of operation into the electronic age. Since computers are not normally designed to perform RTTY operations unaided, specialized hardware interfaces between receiver/demodulator and transmitter, as well as software to control them, were required. Aside from those specialized or dedicated systems for RTTY now available from manufacturers such as Hal, Robot, and DGM, hardware/software is commercially available for the popular Radio Shack TRS-80,* Apple,** and the Pet*** computer systems to provide this added capability to the ham station.

For RTTY/Baudot operation, the requirements of the demodulator/terminal unit (TU) for computer operation have changed very little from the days of the Model 15 printer and current loop driver/relay. The input signal is still provided by the receiver audio, filtered and conditioned by the TU, and output as either an "on" or "off" level, depending upon the mark or space frequencies. However, while the output for the Teletype® printer was required to be a 20- or 60-milliamp current driver for the mechanical system, the computer requires only a plus-five-volt (1) or zero-volt (0) level.

Over the years, many "improved" TU designs were produced to overcome the effects of signal fading, interference, noise, etc. The variation of mark and space shift, that is, the separation between these frequencies, required different filters to be incorporated in the TU to be able to copy the desired signals. Similarly, in order to copy different speeds, switchable-speed filters were required. Amateurs have almost universally standardized on the 170-Hz shift for better noise immunity and on 60 words per minute, since most surplus printers are equipped for this speed. With the approval by the FCC of ASCII operation on the ham bands, new requirements were necessary to enable amateur use of this new mode. Many surplus ASCII machines are available, but not too many amateurs desire to purchase and maintain two machines to be able to operate both Baudot and ASCII. Additionally, ASCII operation is authorized on the HF bands to 28 MHz at speeds of 110 and 300 baud. These speeds are approximately 1.7 and 4.6 times faster than 60 words per minute, respectively, thus affecting TU filter parameters for reliable copy.

In originating design requirements for a TU oriented to computer operation, a number of trade-offs must be considered. First,

*TRS-80 is a registered trademark of Tandy Corp.

**Apple is a registered trademark of Apple, Inc.

***Pet is a registered trademark of Commodore Business Machines.

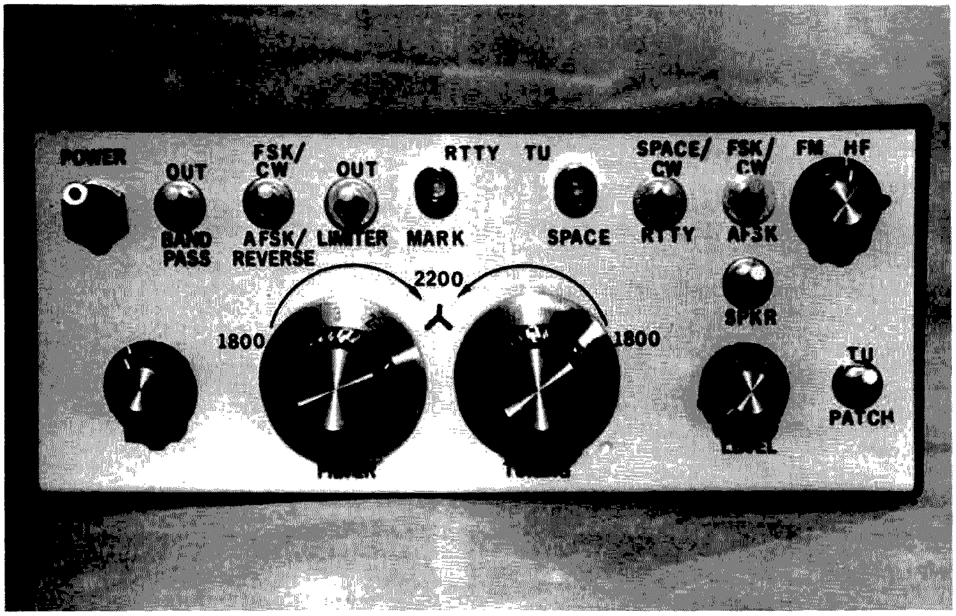


Photo A. Terminal unit front-panel layout.

we must decide whether we will be satisfied with copying only amateur 170-Hz-shift signals as opposed to the older 850-Hz-shift and commercial RTTY stations, such as news service at 425-Hz shift. The trade-off incorporated into the described design provides an input bandpass filter to allow reliable copy of the 170-Hz shift and the capability to switch this filter out of the circuit to pass wider shifts. Differing shifts mean different mark and/or space frequencies which lead to the requirement for multiple filters. This problem is solved by using active filters and designing the space filter with a center frequency which can be varied by front-panel control over the shift range desired. For additional selectivity on wide-shift signals, an available receiver filter may be used to perform the function of the switched-out bandpass unit.

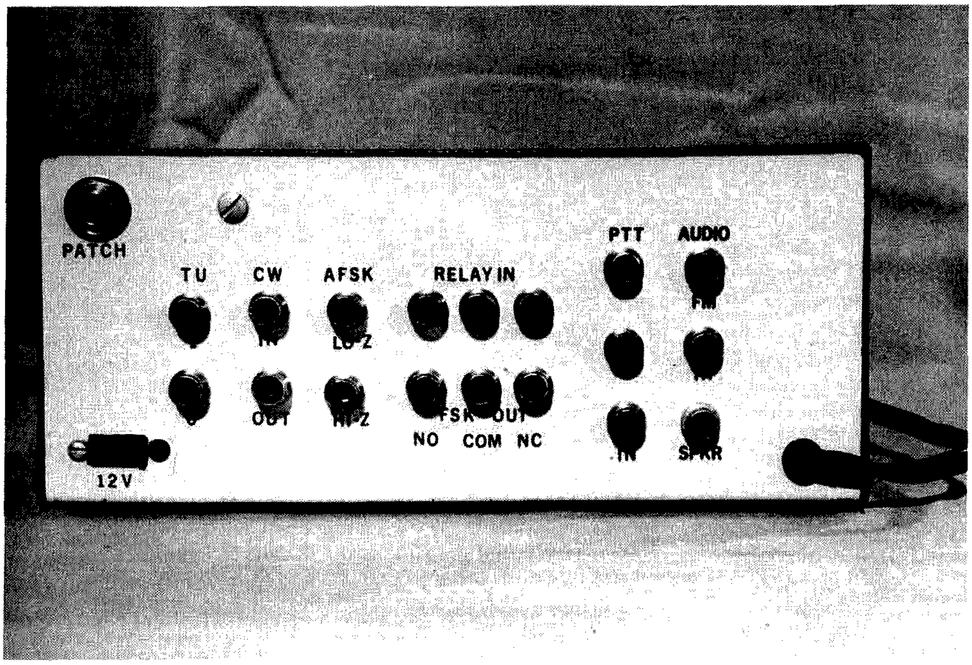


Photo B. Terminal unit rear-panel jack arrangement.

Second, we must determine the amount of sophistication or "bells and whistles" we desire to add. The incorporation of a limiter circuit is a basic requirement for accommodating signal fading. However, the capability of switching out the limiter or changing its parameters for AM-type signals or interference thresholding should also be available and is included in the design. Since this TU is also used to copy CW signals with a TRS-80, a threshold control is provided to allow the level of the desired signal above interference to be set with or without the limiter in the circuit.

Active filters are sensitive to increases in signal level over the design amplitude and distortion in the desired response will occur if this parameter is not considered. Therefore, a single transistor stage has been included which adjusts the signal level when the limiter is switched out of the circuit and precludes overdriving the mark and space filter through the use of clipping diodes in the base circuit. Fig. 1 shows the circuit performance for varying input-signal levels with the limiter switched in and out.

Filter response/width is a function of signal intelligence bandwidth versus noise and interference. Theoretically, a filter of bandwidth "n" should be able to pass "2n" bits of intelligence. However, this figure does not take into account noise, fading, and interference. Naturally, we would like to have the narrowest filter response which will cut off all interference on either side of the desired signal, but one wide enough to preclude having to retune for drifting transmitter oscillators.

The input bandpass filter used in this design can be tuned by the circuit-board trimmers for a bandwidth of 160 Hz with the values shown. This is wide enough to pass 170-Hz-shift mark and space signals without any problems at both 60-word-per-minute Baudot and 110-baud ASCII. However, at 300 baud, with the input filter tuned for maximum amplitude at 2210-Hz center frequency (f_o), the filter response drops off rather sharply, decreasing the mark/space intelligence bandwidth (as shown in Fig. 1).

In order to provide a good recovery capability for 300-baud signals, the input filter is slightly detuned, as described later, to widen the 3-dB width. The LM3900 op amp used for the active filters is a Norton amplifier. It differs from the common 741 op-amp series in that it is a current-differencing device. The main consequence of this difference is that it makes the amplifier a low-impedance device as opposed to the high-impedance 741. Further information on the LM3900 is available from National Semiconductor Corporation in their AN72-15 *Application Note.*

With the values shown and careful alignment, the 2295-Hz mark filter achieves

Sensitivity	0.1 volts p-p
Input filter width, 3 dB	170 Hz (adjustable)
Space filter width, 3 dB	85 Hz (adjustable on panel from 1700-2700 Hz f_o)
Mark filter width, 3 dB	85 Hz, 2295 Hz f_o
Shift reception	100–600 Hz with both mark and space filters in use; adjustable from panel
Adjacent-channel filter rejection	20 dB
Dynamic range (limiter out)	>30 dB
Minimum threshold separation	0.2 volts
Output	5 volts (1) or 0 volts (0) on space or mark
Supply voltage	+ 12.5 volts
Current drain, space on	100 mA; add 100 mA for relays

Table 1. Terminal unit specifications.

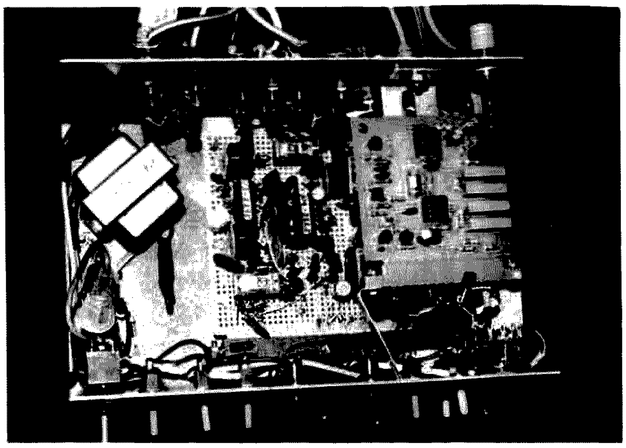


Photo C. Internal view, AFSK board at top right.

a 3-dB bandwidth of 85 Hz. This value is about optimum for any of the RTTY modes encountered in the HF bands. The space filter is that part of the design which provides the capability for copying different frequency shifts and varying bandwidth signals. Front-panel controls allow the operator to tune the filter for a 3-dB width of 85 Hz at the nominal 170-Hz shift frequency of 2125 Hz or tune the center frequency over a wide range of values to accommodate other frequency shifts.

With the component values shown, the old shift of 850 Hz cannot be tuned. This was considered an unnecessary requirement that would have lowered the Q and response of the filter. Obviously, the wider shifts can be implemented, if desired, by switching in different component values.

Although the specifications in Table 1 indicate that 100 Hz is the lowest frequency shift copyable, the TU will copy smaller shifts, depending only on adjacent channel interference and fading. As shown in Fig. 1, the skirts of the mark and space filters are not steep enough to provide more than 20-dB rejection at frequency shifts of less than 100 Hz, but if the only signal in the passband is the desired one and feedthrough in the adjacent filter is not excessive, smaller shifts are possible.

At my QTH, the TU is interfaced to my TRS-80 computer through a Macrotronics M80 unit. Only the space frequency is required for copy. However, this is not an advantage which allows only one channel of the RTTY signal to be processed from receiver to computer. Rather, if such a scheme is attempted on other than a clear FM channel, noise and interference will cause erratic copy and an amount of "garbage" which is directly proportional to the speed of the desired signal versus that of the noise/interference. This anomaly occurs due to the fact that, in a single-channel system which reacts only to the space signal level, when the desired signal is not there (normal mark condition), a time span is open to receive any type of interference which might simulate a space signal.

This problem can be minimized by clocking the desired signal only, but cannot be completely eliminated due to the variation which must be allowed for pulse timing. Therefore, the simplest method of precluding the occurrence is to process the mark signal in the normal manner in the TU and use its detected level to keep the output from switching in the absence of a space signal.

Of course, this method is not valid for copying CW using the space frequency filter. In this mode, we rely on the threshold control to set the switching circuit input to react to the desired signal level only, while the mark channel is switched off. Although the design allows the separation of desired and undesired signal levels to be within 0.2 volts of each other, the desired signal must always be the stronger for reliable copy.

The facility for reversing mark and space filter outputs for AFSK operation is included in the design; a Flesher FS-1 AFSK oscillator board is installed in the TU cabinet for transmitting in this mode on FM.

Circuit Description

Audio input for the TU is obtained from the receiver speaker jack, as shown in Fig. 3. A jack on the rear panel allows the connection of a speaker which can be turned off via a front-panel switch. Transformer T1 converts the 4/8-Ohm audio input to a 500/600-Ohm impedance signal which is controlled in amplitude by a front-panel-mounted 5k pot and switched either to a phone-patch jack or the RTTY/TU position for the demodulator. The 8.2k-Ohm resistor precludes loading down the U1 filter input, while the back-to-back diodes ensure that the input signal will be clipped at a level which precludes overdriving U1.

Relay K1 allows filter U1 to be switched out of the circuit to enable copying wide-shift signals outside of U1's passband. Bandpass filter U1 consists of a 2-pole configuration tuned to a center frequency (f_o) of 2210 Hz. Trimmers R1 and R2 allow the tuning of the filter poles, while the overall Q and gain of the circuit are controlled by the 27k-Ohm feedback resistors. The response with this filter, as shown in Fig. 1, sets the overall bandpass capabilities of the TU. Test point TP1 provides a convenient monitoring point for the output of the bandpass filter.

Limiter U2 captures the strongest signal provided at its input and maintains the output level of that signal despite a decrease in signal strength caused by fading or adjacent signal "pulling." The operation of the limiter circuit for varying signal levels is depicted in Fig. 2. Trimmer R3 sets the offset voltage on pins 2 and 3 to plus six volts, while the 390k-Ohm feedback resistor controls the gain and symmetry of the limiter. The output of U2 is a symmetrical square wave monitored via TP2.

Relay K2 allows the limiter to be switched out of the circuit for better reception of AM/CW-type signals. Transistor stage Q1 maintains the signal level to the mark/space filters when U2 is switched out and clipping diodes in the base circuit ensure that the signal level does not reach a point at which the filters will be overdriven. When relay K2 is activated, relay K3 also switches input resistors to the mark/space filters to maintain appropriate signal level.

The mark and space filters, U3 and U4, operate similarly to bandpass filter U1. The mark frequency of 2295 Hz is set by trimmers R4 and R5, while the space filter frequency of 2125 Hz (or other shift frequency) is set by two pots located on the front panel. The output of these filters is a sine wave which can be monitored at TP3 and TP4.

Relay K4 allows the mark and space filter outputs into the detectors to be switched for AFSK or reverse-shift operation. The detectors convert the sine waves from the filters to a doubled dc level and filter the remaining ac to ground. Test points 5 and 6 provide a means of monitoring the detector output voltage and ensuring that

both mark and space signals are equal in level. The diodes in the base circuit of Q2 and Q4 prevent any interaction between the detectors and transistors, while S7 deactivates the mark output for CW or space-only operation.

Pot R9 is mounted on the front panel and sets the threshold level to Q4, which in turn determines at what point output transistor Q8 will switch to "on." This capability precludes triggering on interference or signals of the same frequency as that of the desired signal but lower in level. When S7 is in the open position, Q2 cannot receive the necessary bias to drive mark indicator Q3 into conduction or turn Q4 off, preventing an output. Thus, any interference in the mark channel during CW or space-only operation will not affect copy.

When driven "on" by the detected space signal, Q4 draws current and applies approximately 4.5 volts on the emitter. This voltage and available current then turn on Q6 (to give an LED indication of space) and Q7, which drives Q8 to the on state, switching the high input from the Macrotronics M80 interface key terminal to ground.

Construction

The TU circuitry was fabricated using a Radio Shack prototype board (which has solder pads for each hole) and point-to-point wiring. This is a time-consuming process requiring careful attention to detail to prevent shorts. However, this procedure was adapted in lieu of the hassle of designing a printed-circuit pattern and to allow ease in circuit modification between breadboard and final-design stages.

Almost all parts are available through local Radio Shack stores; the part numbers listed are Radio Shack numbers. Major exceptions are the power-supply transformer and the AFSK generator board. The power-supply design is not shown since any supply of 500 milliamps or better will work. A regulated voltage is necessary to ensure constant filter parameters; this requirement is easily accomplished via a 12-volt, 1-Watt zener diode.

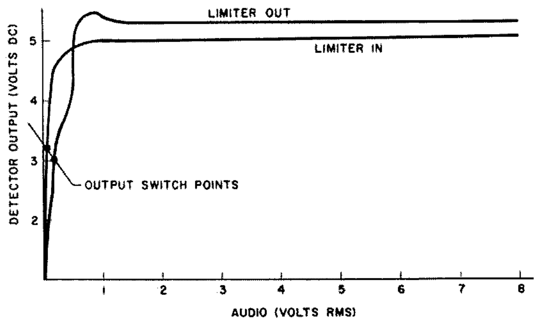


Fig. 1. Circuit performance curves.

Although Radio Shack stocks 12-volt transformers, these units are not enclosed in a metal shield. The metal case is necessary to prevent coupling of the ac field into the audio lines and circuit of the TU. Appropriate transformers are available from a number of supply houses such as Circuit Specialists or from local consumer electronics repair shops which handle Japanese equipment from Panasonic, Pioneer, etc.

Vernier dials or 10-turn pots were considered for the space-filter tuning controls but not incorporated due to the increase in cost over the last year. However, good-quality pots are necessary to preclude dead spots or dropouts when tuning. The FS-1 AFSK oscillator board is available from Flesher Corporation, PO Box 976, Topeka KS 66601, with connector, for $37.50.

Circuit-board wiring is not critical, with the exception that components such as capacitors, which are located in each mark/space channel, should not be placed in close proximity to each other (to prevent adjacent-channel signal pickup). Those capacitors which function as frequency-determining components in the filter circuits should be of mylar™ or polyester construction while others may be of the disk type.

Resistors are quarter-Watt, five percent, for minimum board-space requirements. Sockets are used for all integrated circuits, but transistors are soldered directly to the board. Intracabinet wiring for audio lines should be shielded and the power-supply ac wiring kept away from other cables. The DIP relays should have a dab of contact cement applied to each side where the relay touches the socket to ensure that vibration does not cause them to rise out of the sockets.

The Radio Shack Model 270-253 cabinet provides just enough front-to-back space to mount the prototype board and connector on the bottom of the chassis. There is space on either side of the board for the power supply and input-audio transformer. The AFSK board is mounted above the TU board with connector brackets made from thin aluminum stock and anchored by two of the front-panel switches and an L-bracket support from the rear panel. Intracabinet wiring is shown in Fig. 4.

Power-supply wiring should be done first in the enclosure, followed by the TU-board connector wiring. Installation of the switches, pots, and jacks is then completed, followed by installation and wiring of the AFSK board/connector. The space-filter tuning pots are mounted in the front panel so that the left and right controls both have maximum frequency setting at a marking between the two. Wiring to the pots must be reversed on each to allow the left to operate in a clockwise direction for maximum frequency while the right pot is moved in a counterclockwise direction for the same frequency. Decals or transfers should be applied to the front panel to indicate scale marks around the control knobs.

Alignment

After the normal checks for solder bridges and power-bus shorts, alignment can begin. None of the switches needs to be connected for calibration, but a shorting wire should be connected across the S7 diode if it is mounted on the board. Use temporary connections to the LEDs, which will be panel-mounted later. As a signal source, an audio signal generator is required. If that piece of test equipment is not part of your inventory, you might consider building a breadboard variable audio generator using a function-generator integrated circuit or a 555 timer chip.

Another option is to use the calibrator on your transceiver and adjust the beat note to provide the necessary audio output. In any case, a frequency counter is required to ensure that what you see is what you get. The filters are extremely narrow and any alignment which is off the desired frequency will produce lower gain, distortion, and undesirable operational characteristics.

An oscilloscope is helpful in tracing the signal and confirming relative waveshapes and amplitude. However, the Q of the filters, which makes precise tuning/alignment essential, precludes the use of the scope for monitoring maximum filter response while calibrating. A VOM/VTVM with a dB scale is much simpler to use

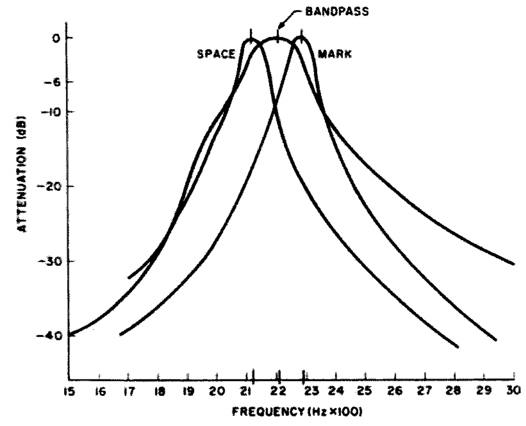


Fig. 2. Active filter response.

for this function. After coupling via a 0.1-uF capacitor from the applicable test point, the meter will show the change in signal level as the filter is aligned to the input frequency. Any oscillation or false response will exhibit a higher-than-normal swing of the VOM needle and should be monitored by the oscilloscope.

As a first step in the alignment procedure, adjust R3 for plus six volts at pins 2 and 3 of limiter U2. Next, attach an input signal source of 2210 Hz to the input and couple (via a 0.1-uF capacitor) the output of filter U1 from TP1 to the VOM/VTVM which has been set to the 10-volt scale. Adjust R1 and R2 until the meter indicates maximum output at this frequency. The 3-dB bandwidth will now be approximately 160 Hz.

If you do not desire to copy anything other than 170-Hz shift in Baudot or 110-baud ASCII, the response of the filter is fine. However, if you desire to use the filter for 300-baud ASCII, you may wish to retune the bandwidth to increase the width and noise characteristics. This may be accomplished by alternately changing the frequency of the input signal from 2125 Hz to 2295 Hz and adjusting R1 and R2 for a meter reading 3 dB below the maximum value obtained at 2210 Hz. Repeat this procedure until the meter reading at both the mark and space frequency is equal.

As you change the input frequency from the lower to the higher frequency, you will notice that maximum gain is still at 2210 Hz, showing that the response has not been degraded but only widened at the 3-dB point via stagger tuning. Note that this adjustment will not affect the capability of the bandpass filter to accept only 170-Hz-or-less shifted signals.

If a scope is available, check the output of the limiter, which should appear as a square wave of equal pulse widths. A check of the filter outputs should show a sine wave without distortion. Once the input signal has been set to the limiter capture level, which is matched to the limiting effect of the diodes across the input and the gain of U1, there should be no noticeable change in output amplitude for further increases in signal level.

Bandpass filter U3 is aligned at 2295 Hz in a manner similar to that accomplished at U1. Use TP3, a 0.1-uF capacitor, and adjust R4 and R5 for maximum meter indication. No further tuning for widening the response of this filter is required.

Bandpass filter U4 is aligned during operation from the front panel by pots R6 and R7. After wiring the pots and connecting the leads to the circuit-board connector, ensure that a frequency range of 1800–2150 Hz can be covered and that when both pots are set to the same frequency, the output level is approximately the same as that provided by U3 at its center frequency.

During the alignment procedure, the appropriate indicator LEDs should have lighted as the filters were tuned. If all is well to this point, continue the alignment. Otherwise, go back and determine where the problem exists.

Set the input frequency for 2295 Hz and attach the meter leads across TP5 with the meter set to read 5.5 volts dc. Record the indicated value. Now, move the meter leads to TP6 and ground and change the input frequency to 2125 Hz. Adjust the front-panel filter controls for maximum meter indication and note the value. If the two readings are not the same, adjust R8 and repeat the procedure. Note that equal output of the detectors is mainly dependent upon the alignment of U1 to pass equally both frequencies and the alignment and gain of U3 and U4.

Since the mark and space voltages drive different parts of the circuit after detection, you should check to ensure that both LEDs light with the same level of input signal. Set the signal generator for 2125 Hz, tune the space filter for maximum output/LED brightness with the FSK/CW/AFSK/Reverse switch in the FSK position, and lower the generator level until the LED is just lighted. If the FSK switch is not yet wired into the circuit, the relay will still be in this position, unactivated. Now put the switch in the Reverse position, or apply 12 volts to the relay lead for K4, and note the brightness of the mark LED. If the mark and space LEDs do not light at the same level, adjust R8 until they do.

Depending on whether you have used the mark or space signal to provide a high or low output, the appropriate LED should illuminate when that signal is applied to the input. The output should measure either 4.5 volts at the "1" jack or almost zero at the "0" jack.

Check the front-panel switches to ensure that they all work, activating the relays or switching the appropriate parts of the circuit in or out. A continuity check with the VOM of the output/input jacks on the rear panel will prevent surprises after the cover is attached.

Operation

After a complete bench check and filter alignment, you are ready to place the TU on line and connect all the interfacing cables. Online tests should start with reception of various RTTY signals to allow you to become familiar with the operation of the TU. Some apprehension was originally felt during the design phase about the ability to tune a signal into the mark channel before tuning the space filter. Operation of the completed unit has shown that this is not really a concern and that the procedure is quickly learned. I had also previously installed a 1-mA meter on the original space output LED of the Macrotronics M80 interface, which helps in the fine-tuning of the space filter and displays the actual level of the switching signal from the TU.[3]

For normal RTTY operation, with all filters and the limiter in operation, the audio-level control on the receiver need only be set in the low range, 2 or below, for a front-panel scale of 1 to 10. The level control on the TU will then provide satisfactory copy for an S9 signal when set about one-third of the way into its range. It is important to ensure that the

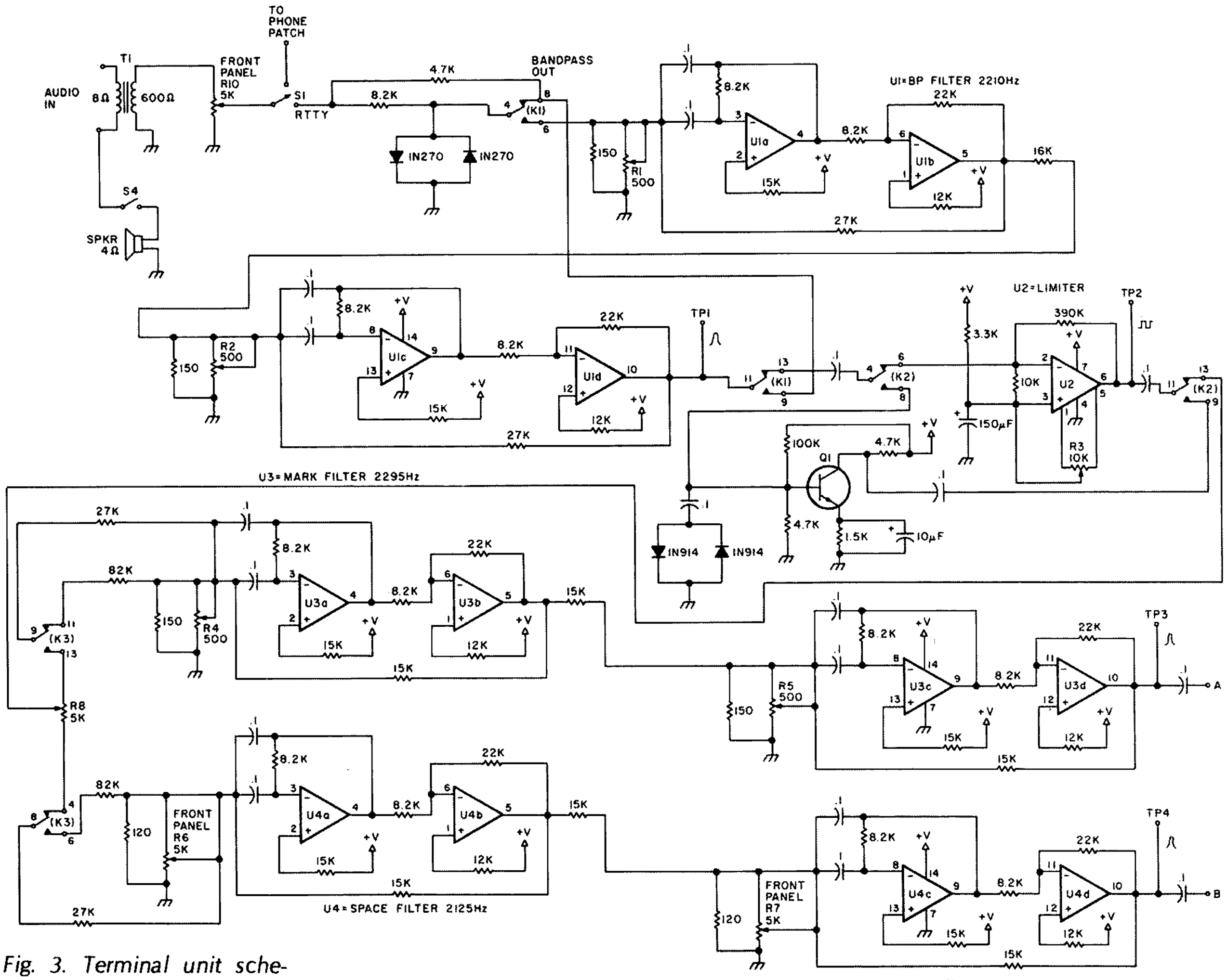
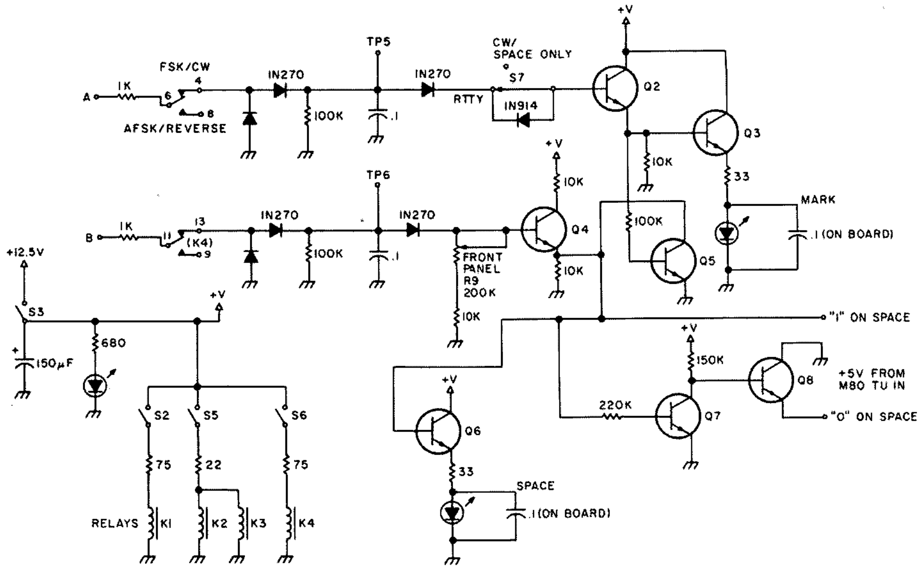


Fig. 3. Terminal unit schematic. T1: 8-Ohm primary, 600-Ohm secondary, or 273-1380. U1, U3, U4: quad op amp 276-1713. U2: 741 op amp 276-007. Q1: 2030 276-2030. Q2-Q7: 2N2222 276-1617. Q8: 2N1305 276-2007. K1-K4: 12-V DIP relay 275-213. LEDs: jumbo 276-021. All front-panel pots have linear taper; all others are miniature trimmers.



input level is great enough to place the signal in the upper portion of the limiter curve for reliable copy on fading signals.

The threshold control is normally left in the extreme counterclockwise position unless it is being used to prevent triggering of an interfering lower-level signal. Once the space filter controls are set to the approximate shift value by the front-panel markings, the signal can be tuned to give an indication on the mark LED. If correctly tuned, the meter on the M80 will show no deflection if there is no space signal. Depending on how close the original settings on the space filter controls were, the space LED may flicker or light with a corresponding M80 meter deflection. The tuning of the first and then second space-filter pole controls will display an equal mark/space LED intensity and maximum space signal on the meter.

Printer or CRT copy should also be evident. Switching to AFSK/Reverse should reverse the mark/

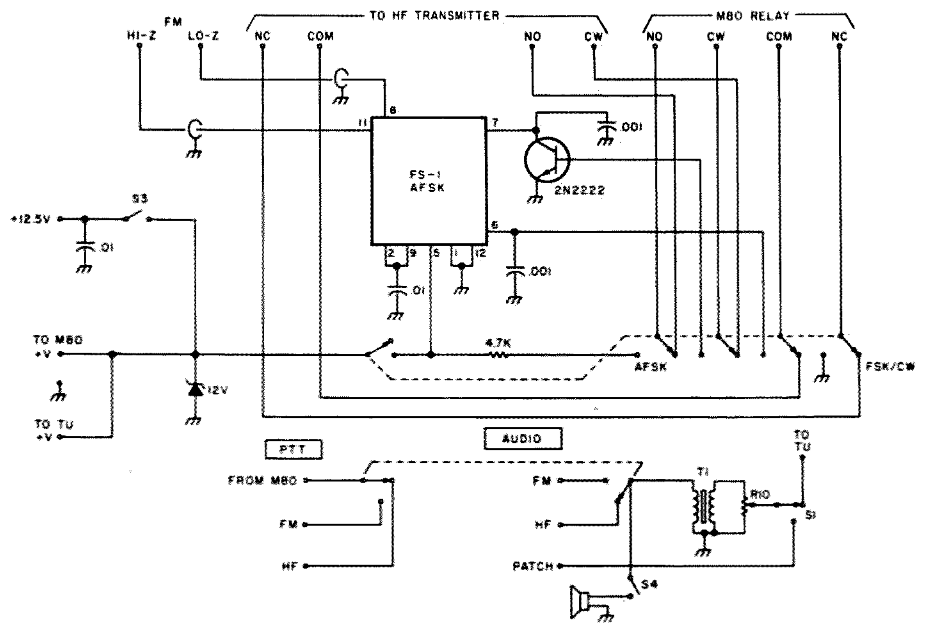


Fig. 4. Cabinet wiring.

space LED indication and meter response and print garbage. The only difference in receiving AFSK, as opposed to FSK, with the function switch in the AFSK/Reverse position is that you are now receiving the 2125-Hz signal on the mark LED. This is due to the fact that AFSK mark and space frequencies are reversed for VHF operation. Therefore, the tuning of the filter controls must be monitored on the mark LED and the first tuning (if not channelized FM) done on the space LED and M80 meter. It is easiest to tune in the normal manner and then switch to AFSK.

For CW or AM signals on HF (such as AFSK), you may find that switching the limiter out of the circuit will provide better reception when noise or interference is present. When this is done, the input level should be adjusted to maintain a reliable switching point and compensate for the hold-in range of the switched-out limiter. The same level adjustment should be made when switching out the bandpass filter to copy shifts wider than 170 Hz.

Referring to Fig. 4, the FSK/CW-AFSK transmit function switch makes all connections for the selected mode. The relay on the M80 interface board is activated by the computer in transmit, but all relay contacts are brought to the TU for the appropriate mode connections. In AFSK, the relay contacts are connected directly to the transmitter vfo.[3] In AFSK, the relay contacts are connected to provide a mark/space keying input to the Flesher AFSK board.

The CW output of the M80 interface is connected to the ID input of the Flesher board through a switching transistor which precludes transmitting the CW ID tone at the same time as the mark tone. When the transmit function switch is in the AFSK position, the mark tone is on and a 2125-Hz signal is sent to the transmitter. The AFSK board has the capability of supplying either 850- or 170-Hz shift. Since only 170-Hz shift is used at my QTH, the 170-Hz position is hard-wired on the AFSK board connector.

Parts List

Part No.	*Description*	*Source*	*Price*
276-153	Plug-in circuit board	Radio Shack	$ 3.69
276-1551	44-pin card-edge connector	Radio Shack	2.99
273-1380	Audio output transformer	Radio Shack	1.29
E7-128	115/12-volt transformer	Circuit Specialists PO Box 3047 Scottsdale AZ 85267	3.19
276-1713	LM3900 quad op amp	Radio Shack	1.39
276-007	741 op amp	Radio Shack	.79
276-2007	2N1305 transistor	Radio Shack	.89
276-2030	2N305 transistor	Radio Shack	.89
276-1617	2N222 transistor	Radio Shack	15/1.98
273-213	12-V subminiature DIP relay	Radio Shack	4.49
276-021	Jumbo LEDs	Radio Shack	2/.89
276-080	LED holder	Radio Shack	2/1.19
276-563	12-V, 1-W zener	Radio Shack	2/.89
270-253	Enclosure	Radio Shack	4.79
276-1995	8-pin DIP socket	Radio Shack	2/.59
276-1999	14-pin DIP socket	Radio Shack	2/.89
275-624	SPST toggle switch	Radio Shack	1.59
275-625	SPDT toggle switch	Radio Shack	1.69
E2-169	2-position, 6-pole rotary switch	Circuit Specialists	1.80
276-1123	1N270/1N34 diodes	Radio Shack	10/.99
276-1122	1N914 diodes	Radio Shack	10/.99
272-1029	220-uF (150-uF) electrolytic	Radio Shack	.89
276-1101	Rectifier diodes	Radio Shack	2/.49
271-210	500k pot (place 270k fixed resistor across for 200k)	Radio Shack	1.09
271-226	500-Ohm trimmer	Radio Shack	.59
271-1714	5k pot	Radio Shack	1.09
FS-1	AFSK board/kit	Flesher Corp.	37.50
M 1143	AFSK board connector	Flesher Corp.	
	Miscellaneous fixed resistors	Radio Shack	4.80
	Miscellaneous capacitors	Radio Shack	6.00
274-392	Knobs	Radio Shack	3/1.99
274-346	Phono jacks	Radio Shack	4/1.79

Most rigs will take the low-Z output of the AFSK board, but both the levels are brought out to the rear panel for use as required.

The FM/HF switch selects both the audio and push-to-talk relay line from the desired transmitter. When using the M80 interface unit with the M800 software, a PTT module is provided which automatically activates the transmitter. The M80 PTT output is the control line which is switched in the TU.

For CW operation, the CW/Space Only switch is used to inactivate the mark circuitry in the TU. Only the space LED is used for tuning with the filter controls, to provide maximum M80 meter deflection. The threshold control can be used to set the switching level to prevent lower-level adjacent-signal interference. In CW transmit, the transmit function switch connects the CW output of the M80 through the TU switch to the transmitter key input. This same connection is made for FSK.

Operation has been both gratifying and educational. It is interesting to watch the independent fading of mark versus space signals, as shown by LED brightness and M80 meter deflection. The only other evidence of poor copy occurs when the signal of interest fades while a background signal, which was not heard before, increases in strength and captures the limiter. Good copy has been obtained on low-level signals which are not strong enough to provide an LED indication. ■

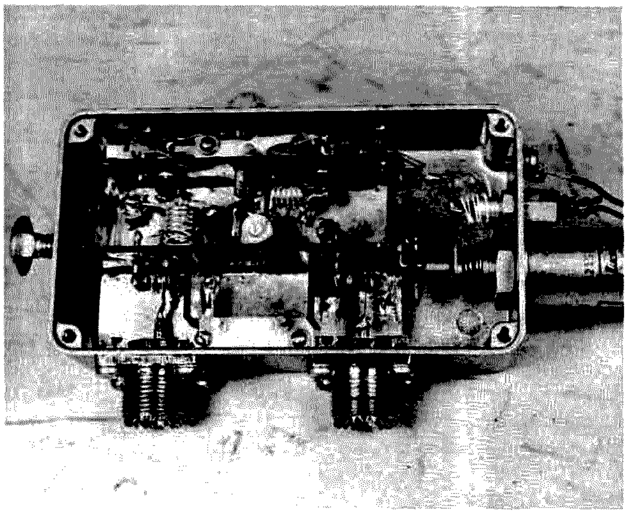
References

1. *Specialized Communications Techniques*, ARRL.
2. "Active Bandpass Filter for RTTY," Nat Stinnette W4AYV, *Ham Radio*, April, 1979.
3. "Welcome to the '80s," F. Dale Williams K3PUR, *73*, July, 1980.

Wheeling and Dealing with Preamps

For a switch, from the remote hills of West Virginia comes a great antenna idea.

Robert E. Brossman W8PMS
115 Oakmont Hills
Wheeling WV 26003



An overall view of the completed preamp.

After many years of 2-meter FM operation, I found myself increasingly interested in SSB operation on the lower portion of the band. After spending an evening in the shack with Don WB8ZTV and hearing for myself the potential of SSB and CW operation, I was soon the proud owner of a brand new all-mode rig.

The old 11-element vertically-polarized beam soon went to its storage place (holding up tomato plants) and a homemade 6-element horizontal took its place on the tower. Local FM operation was unaffected by this change, and contacts out to 75–125 miles were possible with the 10-Watt output of the all-mode rig.

A 4CX250 amplifier that provided around 300 Watts output in linear or Class C had been around for a while and this enabled occasional contacts in the range of 150–200 miles. Before anyone scoffs at the limits, let me remind them that this area of West Virginia is quite hilly and that I live well below the tops of the surrounding aforementioned geographic features; hence, I felt reasonably pleased with the performance of my equipment.

My only problem was listening to Don run his weekly SWOT net and realizing that I didn't hear half of the stations that he was routinely conversing with week after week. Now, don't get me wrong, I fully realized that he had a superior location, stacked 88-element super whizbangs, and an antenna-mounted GaAsFET preamp, so I decided that my first project would be to try putting together a respectable preamp to mount at the antenna.

After researching several articles on preamp construction, it became apparent that one of the major problems and least discussed chores associated with remote devices such as this was switching the preamp in and out of the transmission line during use.

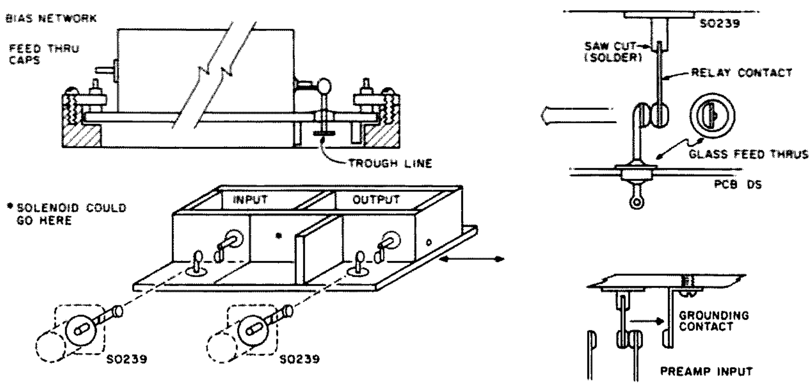
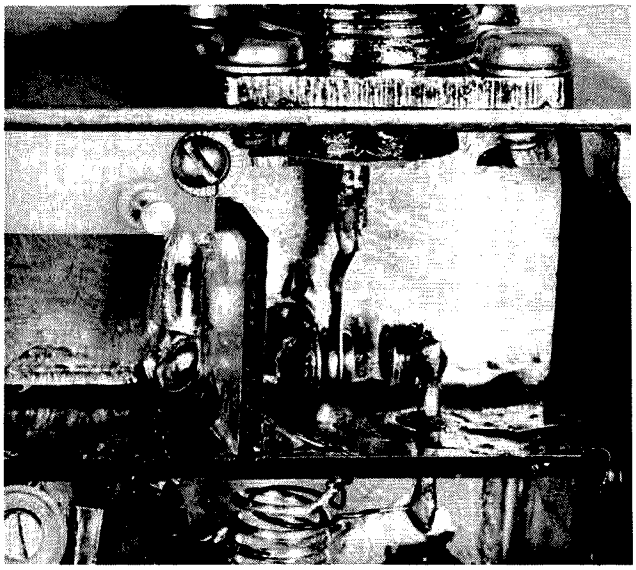
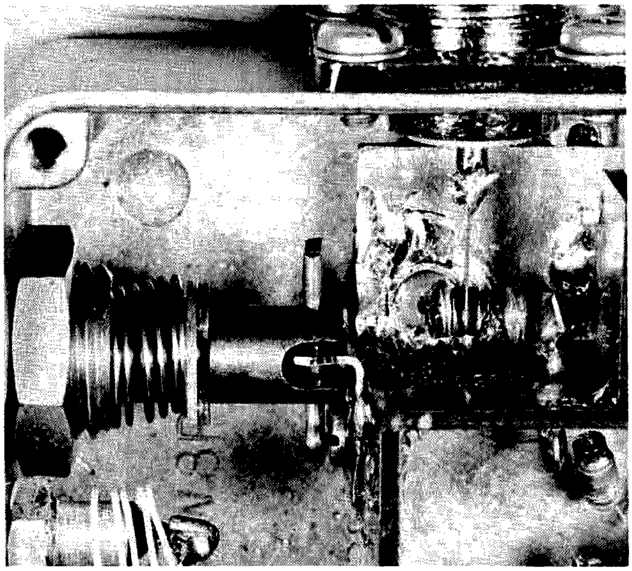


Fig. 1. The approximate method of fabricating the double-sided printed circuit board base and shielding of the preamp. The shields are covered with copper foil "lids" that are soldered to the edges of the shield enclosures. The drawing also shows the mechanical details of the switching contacts.



A detailed view of the input contacts of the preamp. The glass feedthroughs are visible, and the method of attaching the relay contacts to the feedthroughs can be seen.



Some details of the output end of the preamp. The relay contacts and the mounting of the solenoid are seen. The copper foil covers of the preamp shields are not in place.

Being a peculiar type of person that hates to cut and strip coax for BNC connectors, I felt that there had to be another means of switching a device like a preamp without the need for multitudes of ¼-wave cables and 2 BNC-type relays. What could be simpler than making the whole PC board (containing the preamp circuits) switch back and forth with a solenoid?

After several attempts, the mechanical layout shown in Fig. 1 was produced. The rf circuit does not represent the state-of-the-art in VHF rf amplifiers, but it does serve to illustrate the concept. With the addition of a few more contact strips, it would be possible to either ground the input and output of the preamp during transmission or switch them to ground through 50-Ohm resistors. The latter method seems to be the manner of choice when using GaAsFETs.

The preamp is switched out of the transmission line until the solenoid is energized. Power for the preamp is now supplied separately through an extra pair of wires in the antenna rotor cable. A 24-volt-dc supply is used, and an LM317 adjustable voltage regulator is now inside the preamp box. Remember to include the bypass capacitors on the regulator input and output. The solenoid is also shunted with a 1N4004 diode to protect against the voltage spike produced when the magnetic field collapses on turn-off.

Isolation of the preamp circuit during transmission is at least as good as some of the VHF BNC relays and could be increased by physically increasing the spacing between contacts. The design routes the rf path during transmission to the underside of the double-sided PC board where it forms an air-insulated troughline between the PC board and the diecast box. Granted, there would be other ways to improve the impedance bump that this arrangement produces, but it is no worse than the average swr indicator.

I plan to eventually dedicate an MGF-1400 GaAsFET to the MRF-901's role, but it did provide a wealth of experience in rf amplifier design at a low cost. The original circuit (Fig. 2) proved to be extremely unstable, even with several changes of transistors, and the circuit of Fig. 3 eventually evolved. It was much easier to tame while still providing usable gain. The instability is a function of the device and only means that the MRF-901 is really a poor choice for a 2-meter rf preamp. Anyone who would like to check out that statement is referred to an article by B. H. Krauss WA2GFP, in the December, 1981, issue of *QEX*.

Construction

The circuit is mounted inside a diecast metal box approximately 4.5″ × 2.5″ × 1″ (Hammond 1590B). Input and output connectors shown are SO-239, but BNC- or N-types are easily substituted. A fine saw is used to cut a slit in the center pin of the connector in order to mount the fixed contactor (salvaged from a 5-Amp DPDT relay). The saw blades are available from X-acto® and can be found in any hobby or hardware store.

The feedthrough connectors are an item I picked up in a flea market and are

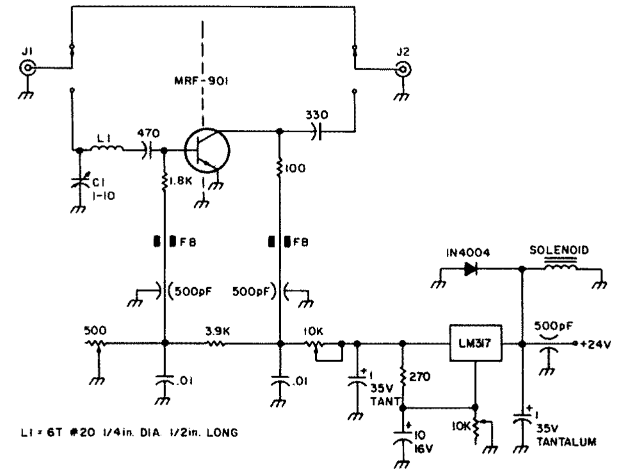


Fig. 2. The original circuit diagram. The MRF-901 proved to be very unstable in this configuration.

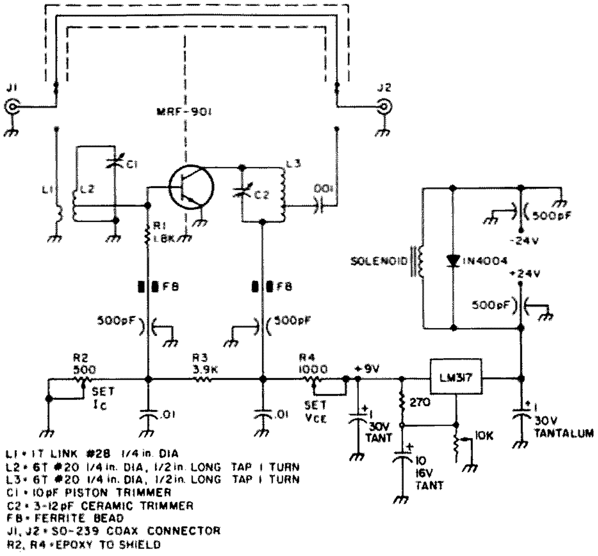


Fig. 3. The final circuit that was used in this version. It is reasonably stable once the initial tune-up is completed. It is much more narrow-banded than the original.

glass insulated. They represent the only parts that might have to be specially fabricated and might be substituted by using brass rod epoxied in the center of brass grommets. These are available anyplace that sells sewing supplies. The silver contacts for the relay end should be soldered to the rod before trying to fill in the epoxy resin. I made loads of these for feedthrough use years ago, and they can be made by sticking the rod into a wax block (paraffin canner's wax), centering the grommet, and filling in the center of the grommet with epoxy on a small screwdriver blade.

The PC board is mounted on a pair of brass rails that act as guides during the mechanical shifting. A springy piece of finger stock maintains a good ground contact on the underside of the PC board during operation. Teflon® blocks are attached to the side rails and are used to hold the PC board. Any method that will permit good electrical contact with freedom of motion should suffice.

The solenoid used is a Ledex #12180133-REV A. It just surfaced in the junk box; however, it is possible to modify any screw-mounted solenoid to perform the task of pushing the PC board into its preamp position. There is sufficient spring tension to return the PC board to the neutral, or transmit, position when power is removed from the solenoid. Radio Shack is currently selling a 12-volt solenoid that should be usable.

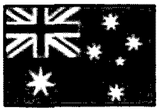
A final construction tip is to drill and tap a hole on the end of the diecast box that will allow you to run a ¼-20 screw into the shielding to manually switch the preamp to receive position during tune-up.

I would not recommend trying to use the Hammond box out in the weather. It is not waterproof, and the solenoid, having a steel armature, will probably rust and freeze up if used where it can get wet. The whole assembly should be packaged inside a weatherproof enclosure of metal or plastic if it is mounted at the antenna. ■

73 INTERNATIONAL

Each month, 73 brings you ham radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Jack Burnett.*



AUSTRALIA

Jim Joyce VK3YJ
44 Wren Street
Altona 3018, Victoria
Australia

It has been claimed that no two nation's people are more alike in all ways than Australians and New Zealanders. Considering our common heritage, it is not surprising that there were moves in the late 1900s to make New Zealand another state of Australia, but the plans were eventually dropped.

With New Zealand being closer to the eastern states of Australia than our own West Australian city of Perth and with, up until lately, no travel restrictions between our two countries (e.g., passports, health certificates, etc.), it is no wonder we have a unique relationship with our Kiwi (as we call them) neighbors.

With this in mind, the annual VK-ZL-Oceania contest has a special significance to both of us in further cementing our close relationship via amateur radio. Sponsored jointly by the WIA and NZART on alternative years, this contest aims at attracting overseas participation looking for contacts in those areas.

This year there should be a good chance of picking up a rare one with Warrick ZL8AFH from Kermadec, if he gets the time with his work load—and also if he gets his amateur gear fixed. At the present time, he is waiting for an air drop of either another rig or parts to repair his own gear. Warrick also has been heard using commercial marine gear, operating on both 40 and 80 meters, the frequencies being 3874-3855 and 7774.

David VK0CK is operating from Macquarie Island; with an added bonus of a six-meter beacon in operation from this location, VK0GL should be active from Mawson with an interest in both HF and VHF.

I cannot guarantee that these stations will be on frequency during this contest, but with most of the South Pacific islands having at least one or two Australian or New Zealand amateurs as residents, the chance of picking up a new one is quite good.

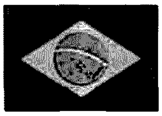
This contest is held on the first and third weekends in October each year, with phone on the first weekend and CW on the third. The contest lasts for the full 48 hours each weekend.

We in VK have lately been given extensions to our frequencies of operation, two of which should be of interest to OX operators, considering the downturn in the sunspot cycle. We now can operate on 40 meters from 7000 to 7300, and we have a DX window of 3795 to 3800 on 80 meters.

When listening, please don't forget that our Novice operators can operate only on 10 meters up to 28600, on 15 meters up to 21200, and 80 meters up to 3825. With only 30 Watts PEP output allowed, you will have to listen real hard to hear them, with the band conditions of late.

Any queries regarding VK contests in the 1981-1984 period should be directed to our Federal Awards Manager, Reg Dwyer VK1BR, PO Box 238, Jamison, Australian Capital Territory 2614, Australia.

Good luck in the contest!



BRAZIL

Gerson Rissin PY1APS
PO Box 12178, Copacabana
20000 Rio de Janeiro, RJ
Brazil

RFI SYMPOSIUM

Sponsored by the Brazilian Amateur Radio League (LABRE) and the National Telecommunications Department (DENTEL), the symposium was held in the city of Porto Alegre, the first such trying to solve RFI problems between the radio operators and the sound listeners. The most important factories of sound equipment in Brazil were represented, among them, Philco/Hitachi, Sharp, Telefunken, Sanyo, and Evadin.

According to Brazilian laws, the participants agreed that RFI should always be considered as due to the sound equipment, and all complaints must be met by the factories. This decision made the radio operators happy, and it was a big step toward solving also the TVI problem, when sometimes it is due to the TV manufacturers.

WORLD COMMUNICATIONS YEAR STAMP

To commemorate World Communications Year, the Brazilian Post issued a special stamp. A must for collectors, the stamp shows the domestic Brazilian satellite and is printed in offset, in blue and orange over phosphorescent gummed paper. If you are interested in the special stamp, you may request it from: Divisao Central Filatelica, Edificio-Sede, ECT, SBN, Conjunto 3, Bloco A, 20° andar, 70002 Brasilia, DF, Brazil.

144-MHz EXPEDITIONS

During the last weekend of June, 1984, will be held the Third 144-MHz Expeditions, an event which brings together Brazilian operators interested in propagation experiences on the two-meter band. The expeditioners reach the top of the higher hills with their equipment—generators, antenna arrays, etc., doing their best to make long-distance QSOs. Last year, in spite of poor weather conditions, more than 1,500 long-distance QSOs were made by about fifty expeditioners.

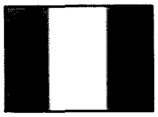
DMS AWARD

Sponsored by LABRE in the state of Mato Grosso do Sul, the DMS Award is available to all licensed amateurs for confirmed contacts with PT9 stations as follows: South American countries: 10 contacts; other countries: 5 contacts. QSOs must have been made after February 2, 1978, on any amateur band and any mode. No QSLs; send GCR list of PT9 stations worked (call, date, time, band, mode, and report) and 15 IRCs for mailing expenses to DMS Manager, PO Box 08, 79100 Campo Grande, MS, Brazil.

SAO PAULO A/Z AWARD

Sponsored by the Brazilian Amateur Radio League of the State of Sao Paulo (LABRE-SP), the Sao Paulo A/Z Award is available to all licensed amateurs for confirmed contacts with 28 stations located in the state of Sao Paulo (PY2) which have all 28 different letters, considering only the last letter of each call. Example: PY2XXA, PY2XXB. . .PY2AAY, PY2ABZ. Contacts must have been made after August 1, 1977, on any amateur band. Only two-way CW mode. No QSLs; send GCR list of stations worked (call, date, time, band, mode, and report) and 15 IRCs for mailing expenses to LABRE-SAO PAULO, Diretoria de Concursos e Diplomas, PO Box 22, 01000 Sao Paulo, SP, Brazil.

Gerson PY1APS and his wife, Mirian PY1XBT, and their twin daughters, Natasha and Tatiana.



FRANCE

Claude Guee F1DGY
11 Rue Emile Labiche
28100 Dreux
France

FRENCH LISTENERS (FE)

For two years new French SWLs have not been receiving official licenses. As a matter of fact, before the CB legalization and during the big growth of CB, many CBers asked for this FE call (free of charge), this way getting the official OK for their antennas. Next year, it is likely they will be issued again, nevertheless with, probably, two alterations: an annual charge (why not!), and no official OK for an antenna. So, till then, don't be afraid to receive some French SWL QSLs with calls like REF, URC, or eventually, FEM, instead of the official FE. In fact there are provisional "calls" issued by different ham associations (association code numbers).

70-CM BAND

In 1984, a new band plan will be used for a maritime radio-navigation system called Syledis. French hams living near coasts and harbors are rather worried; they have to share the 430-434-MHz part exactly in the new UHF repeater's band. Some years ago, this part was unused. Fortunately, Syledis is known as a very excellent system, and QRM could be weak. We'll wait and see. . .

COLUMBIA, STS-9, W5LFL, AND EUROPEAN SPACELAB

For this event, the French broadcast station Europe 1, thanks to its scientific reporter Albert Ducrocq, had the bright idea to light up the Greenwich meridian (and also partly the Paris meridian) when the shuttle crossed this line, for the beginning of this mission. This was done with hundreds of headlights along about a 180-mile line! The center (La Fleche airport) was marked by a fiery cross. Thanks to clear skies, the shuttle's passengers should have seen this winking!

W5LFL was heard by many hams here, and many hoped to receive the first space QSL!

EXPEDITION RUMORS IN 1984

FO Clipperton with W and FO8 hams, and YV0.

SOME FRENCH OVERSEAS AWARDS

The usual conditions apply to these awards. Sent certified log extracts only. QSLs are not required.

1) *FO: Tahiti*—6 contacts with FO8 stations; fee: 12 IRCs; manager: Radio Club Oceanien, BP 374 Papeete.

2) *FK: Nouvelle Caledonie*—6 contacts with FK8 stations; fee: 12 IRCs; manager: Guy Francois FK8DH, Villa 55 Tontouta.

3) *FP: Saint Pierre Et Miquelon*—Two classes: phone, 3 contacts with FP stations, and CW, 2 contacts with FP stations; fee: 3 IRCs; contact after January 1, 1981, manager: Henry Lafitte FP8HL, BP 1107, 97500 St. Pierre et Miquelon.

4) *FY: Guyanne*—6 contacts with FY stations; fee is 3 IRCs; manager: Christian Loit FY7AN, Cite Rebard, BP 748, 97305 Cayenne. (Note: In French Guiana there is a 50,035-MHz beacon call: FY7THF (100 Watts, GP antenna); Send reports to FY7AZ, BP 1001 Cayenne.)

5) *Diplome des Ameriques Francaises*—Certified contacts (after January 1, 1966) with 2 FP8s, 2 FG7s, 2 FY7s, and 1 FM7 or FS7; for Asian or Oceanian stations, only one contact is required; fee: 10 IRCs; manager: Alex Desmeules VE2AFC, 2525 La Fleche Sainte Foy, Quebec G1V 1J9, Canada.

GREAT BRITAIN

Jeff Maynard G4EJA
10 Churchfields
Widnes WA8 9RP
Cheshire
England

THE UK SCENE

By the time you read this, the flight of W5LFL in *Columbia* will be some months old and will have entered the realm of ham folklore. However, as I write this piece, the shuttle has barely landed and I guess the computers are still warm.

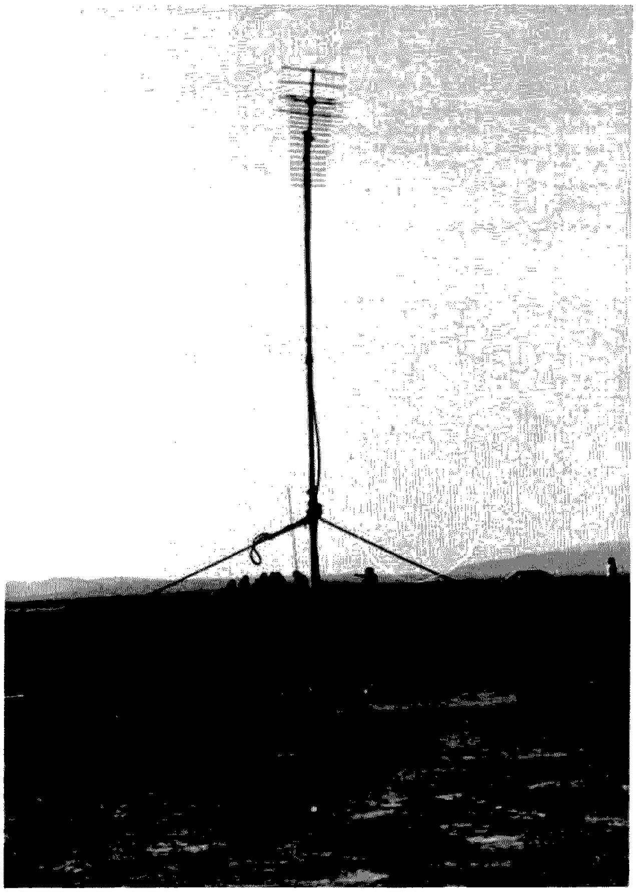
You might be wondering why I have chosen even to mention the project knowing it will be so long before this is in print. I am doing so because I feel that there is a lesson to be learned and a message to be repeated loudly to all hams. The message is, of course, do not let us have another ham in space.

Please don't give up reading in disgust at this point, thinking I am a head-in-the-sand merchant against progress and innovation. Far from it; I do like to see new activities, new ventures, and new technology. I also think the entire shuttle program is a marvelous tribute to American technological know-how, and W5LFL is my new hero.

Why then, the antipathy towards any further such missions? Well, this is largely because, I am sorry to say, W5LFL's trip brought out a side of amateur radio I would not wish to see again. I will explain this, but first some background.

There has been keen interest in the United Kingdom in the ham-in-space program since it was first mooted about some time ago. When NASA gave tentative approval there was considerable activity. The RSGB magazine, *Radio Communication*, outlined the proposals as did the AMSAT-UK newsletter, *Oscar News*.

With the shuttle flight quite close, *Radio Communication* featured a long article describing the proposed operating method and suggesting likely times of



One of the test antennas.

spacecraft visibility in the UK. *Oscar News* featured more detailed information on the orbital parameters expected. As the time of launch drew closer, the Sunday morning news bulletins from RSGB (on 2 meters and 80 meters) gave very comprehensive coverage of the final plans for operating and the expected launch program. AMSAT-UK nets on 80m and on OSCAR 10 talked of little else but the shuttle program, and much time was spent swapping orbital prediction programs and planning strategy.

The RSGB set up a telephone-answering machine giving up-to-the-minute information. (So popular was this, that I ended up calling Westlink in California after trying unsuccessfully for two days to get through to RSGB.) The Sunday morning newscasts became daily, with bulletins each evening at 1700 local time on 80m for the duration of the mission. AMSAT-UK of course was having a field day with nets and special news sheets (even *Radio Communication* for December carried a loose insert with the latest orbital predictions).

So you would expect everyone to know what to expect and to know what to do. I was active for five of the projected overpasses of the UK. I did not hear W5LFL, but I did hear enough to suspect that he would not wish to have had any QSOs with UK stations. First, there were the lids who can't read, didn't read, or just did not believe what they were given by the RSGB. Calling on the downlink was the favorite of course—even by some G3s whose callsigns indicate that they have held a license for at least 15 years (and are presumably, therefore, of mature years).

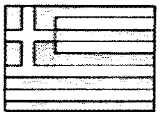
Lids also invented their own brand of brief, short, snappy calls to minimize uplink occupancy: *CQ CQ CQ W5LFL*—and *CQ CQ CQ* Columbia, and *CQ CQ CQ* Columbia, *this is G6??? calling from Puddlehampton in* . . . all of which was enough to occupy the entire pass, never mind the one-minute listening period. Mind you, stations were heard calling *Columbia* up to one hour before the computed (and much publicized) AOS times.

One could, perhaps, forgive the above-mentioned operators for just enthusiasm. But what of the following—

- running RTTY (RYs) on one of the uplink frequencies
- publicly stating that 145.550 (the downlink) is for everybody's use, and calling CQ
- responding with foul language to a polite request to move from the downlink frequency
- telling listeners that the mission is "silly" and threatening to jam if heard
- boasting of running enough power to drown every other UK station

I might have heard more, but I gave up listening. I did not think hams anywhere could behave so badly, but to hear it in England was very sad.

I salute the shuttle program and Dr. Garriott, but please don't give him a rig again.



GREECE

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Greece

With AMSAT's new bird, OSCAR 10, the need for a good UHF antenna is a must for somebody who wants to work with it. So, many amateurs in Greece, after the successful departure of the satellite, were thinking of what antenna they should put on. Since Greece doesn't offer many choices for buying goods like that, many of us make our own antennas, but there are not suitable instruments to test them.

So, one day while on a round table on a local channel on two meters, SV1DH promised to bring a very accurate power meter in order to test the homemade an-

Left to right: SV1OE, SV1RJ, SV1DC, SV1IW, SV1DH, and SV1HM.

Left to right (standing): SV1DS, SV1DH, SV1DC, SV1AB, SV1RJ, and SV1RC; squatting: SV1BL, SV1OE, SV1RL, and SV1IW.

tennas along with some commercial ones, too.

The antenna party was organized very fast, and about ten days later on a beautiful Sunday morning, more than 25 SV hams were gathered in Spata, a place some 10 miles east of Athens. This place is a very large area free from obstacles of any kind, as the new International Airport of Athens will be there.

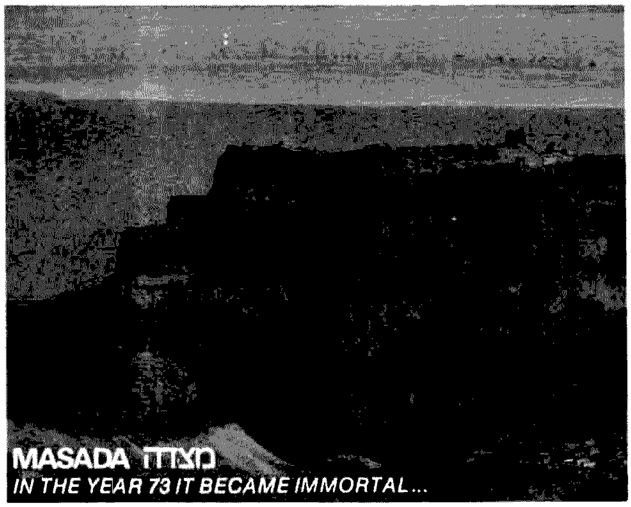
In the transmitting position, an FT-790R UHF transceiver was put with a 23-element Fracaro antenna on a 20-foot mast. On the other end, 200 feet apart, the HP-432A power meter was ready with all the antennas under test.

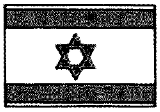
The measurements for the antennas are in Fig. 1. Note that all of them were put on a similar 20-foot mast just like the transmitting antenna. As you can see, for some of the home-brewers things are not so easy, while on the other hand a few have made very good copies of some popular antennas such as the Jaybeam Parabeam.

Finally, besides all of these measurements, it was a very pleasant Sunday morning; the weather helped a lot for about 25 people to meet and have fun playing amateur radio!

Antennas	Gain	Front to back	Front to side L	Front to side R	Manufacturer's gain
19-element F9FT	12.7	22	18	15	16
21-element F9FT	14	20	17	12	18
88-element Jaybeam's Multibeam	15.2	21	11	13	18.5
15-element Ouagi (homemade from SV1RL)	10.5	4	11	14	15
17-element Parabeam (homemade from SV1RC)	12.5	15	11	13	14.9
19-element F9FT (homemade from SV1LY)	8.6	23	22	22	16
23-element Fracaro	9.8	26	22	22	—
13-element K2RIW (homemade from SV1LY)	8.6	17	13	13	—

Fig. 1.





ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
Negev Mobile Post Office
85530 Israel

THE MASADA EXPEDITION

"Masada? You'll never be able to get a signal out from there down by the Dead Sea!"

That was the kind of reaction received by Dani 4Z4GU and Adam 4X6IY when they let it be known that they were organizing an amateur-radio expedition to this ancient fortress.

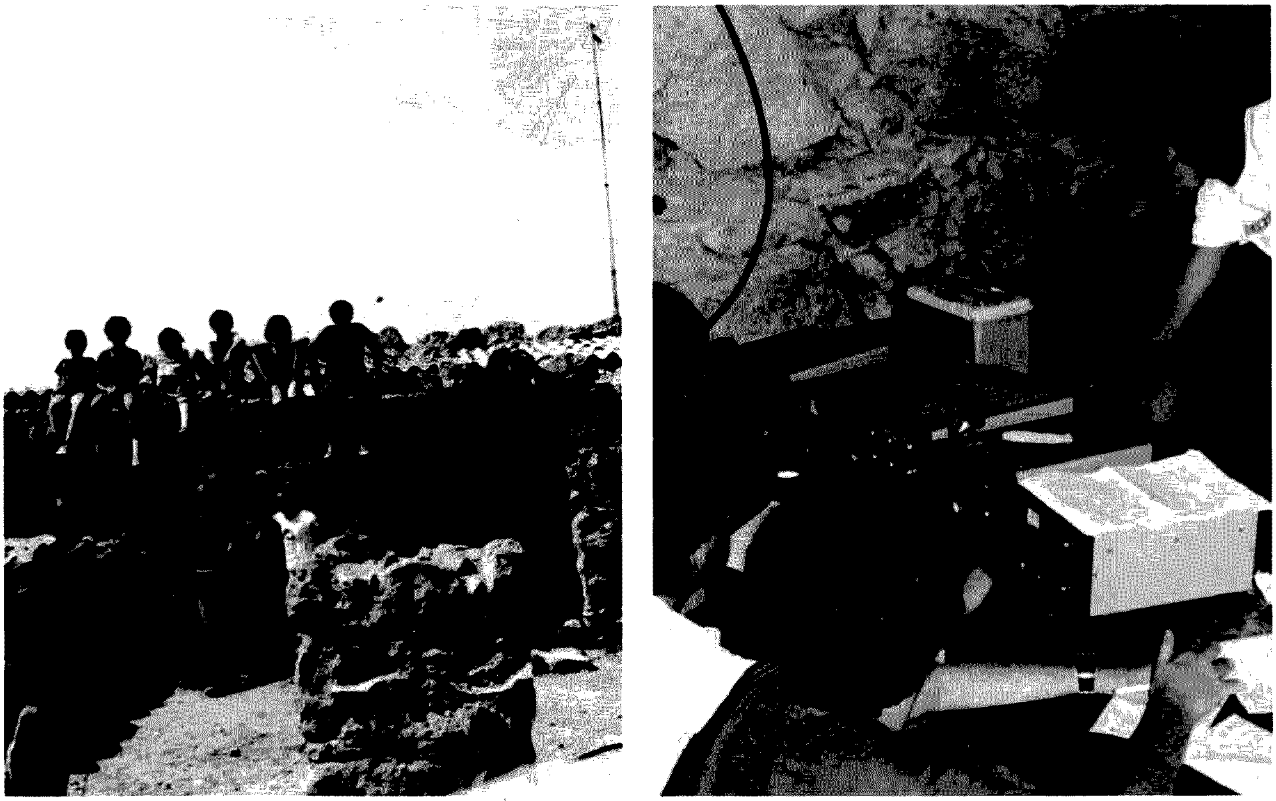
The event—the 1983 Scouts' International Jamboree On The Air; the place—Masada, a fortress dating back to the time of Christ situated on a rock plateau overlooking the Dead Sea, the lowest spot on the face of the Earth. Dani and Adam, leading six members of the Tel Aviv Sea Scouts' radio club, ventured out to this foreboding spot, set up 4Z4HS/Masada, and dispelled for once and for all the myth that this area is an rf trap!

A few words about the history of Masada: Situated in the parched Judaean desert, hovering 1,425 feet over the Dead Sea, stand the remains of this stronghold built by King Herod around the year zero. Containing vast food stores and a cleverly-engineered system of drainage canals and cisterns to catch every valuable raindrop, King Herod designed this place to be both his winter palace and a place of refuge from his many enemies, both real and imagined. Perched on top of sheer rock cliff, it was easily defensible.

A few generations later, with the Jewish rebellion against the Roman Empire, Masada was the site of the last stand of the Zealots. Jerusalem fell to the legions of Emperor Titus in 70 AD, and Masada's defenders held out under siege for three more years. Painstakingly building a massive embankment up to the top of the plateau, the Romans were able to bring their catapults and battering rams to the walls of Masada. When they reached the top and entered, they found that the defenders had taken their own lives rather than fall into captivity. This closed the last chapter of Israel's independence in ancient times.

Today, Masada has become a kind of national shrine. Excavated by archeologists, many of its ruins have been reconstructed to give an idea of what it was once like. A few years ago, a cable car was installed to ease the visitor's ascent up the rock face.

Armed with a TS-830, gasoline generator, storage battery, a twenty-foot mast and assorted dipoles, the group from the Sea Scouts made their way from Tel Aviv to the Dead Sea in the Great Rift Valley. Unloading the gear from the cable car, the



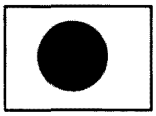
The Tel Aviv Sea Scouts on the 1983 Scouts' International Jamboree On The Air, at Masada, overlooking the Dead Sea. (Photos by Dan Shalem 4Z4GU.)

setting up of the station went without a hitch and it looked like clear sailing ahead.

Suddenly a sandstorm blew up from the Judaean desert. The scouts were forced to retreat into a reconstructed building, and when they got back on the air they found that they were in what had once been King Herod's bedroom!

The twenty-meter band was in good shape and good, clear signals were pouring in from Europe and Africa, with weaker ones being heard from Oceania and the Americas. In the finest tradition of the Jamboree On The Air, Dani and Adam's scouts were making contact with their counterparts around the world, exchanging their names and ages. Many pages of the log were filled, and the group felt the venture to be a huge success.

Masada will be on tha air again! Dani has invited me to a similar expedition he is planning with the Sea Scouts. So, in October, 1984, keep your ears open for 4X4HS/Masada!



JAPAN

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Shibuya-Ku
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Japan

QUESTIONS MOST OFTEN ASKED ABOUT JAPAN

Throughout the years as a resident here in Japan, I have been asked many questions about ham radio in this country, such as regulations, statistical information, etc., as well as many non-ham-related items. Here are some of the most-often-asked questions along with the answers, which I thought might be interesting. This also might possibly be saving of my time so that I don't have to answer the same questions more than once!

Q: How many Japanese hams are there?

A: There are 1,080,000 operators and 578,000 stations at the present time.

Q: Why this difference between operators and stations?

A: In Japan, the operator's license (good for life) and the station license (5 years) are separata.

Q: It looks like a lot of operators don't have a station. Right?

A: Right. Many are high-school and university students who confine their operating to the school club station and have never applied for their own station licenses. Also, in Japan some families have a "family club callsign," which all family members with an operator's permit may use. Another factor is that since the operator's license is lifetime, the big number doesn't reflect those who have lost interest in ham radio.

Q: Since there are so many hams in Japan, I am surprised that the DX Callbook lists so few. Why is that?

A: Simply because no one has taken the time to translate the Japanese callbook into English. The Japanese calls and addresses listed in the American *DX Callbook* have apparently either been sent in by the Japanese ham himself or sent in by an American ham friend. Incidentally, the Japanese ham callbook is enormous—as you would expect. It contains 1,500 pages, weighs over 4 pounds, and costs approximately $27.00. And, as stated above, it is entirely in Japanese.

Q: I am a US citizen planning to be in Japan for a month. Can I operate?

A: As of the date of this writing there is no reciprocal agreement yet, but you could possibly operate a club station. The problem is that it takes from two weeks to a month to obtain permission to operate, assuming that you find a club willing to lend you its callsign. The Tokyo International Amateur Radio Association (TIARA) might be able to help you. Just call 585-2236 after you arrive in Japan.

Q: Is repeater operation permitted in Japan?

A: Yes, on 435 and 144 MHz, since 1982.

Q: How about phone patches?

A: Not allowed.

Q: How about fax, RTTY, and slow-scan TV?

A: Yes, they are allowed.

Q: What are the power limitations?

A: The two Novice classes are limited to 10 Watts output; Second class is 100 Watts; and First class generally is 500 Watts although First class is actually open-ended, applications being considered on a case-by-case basis. For instance, I know of one Japanese ham who runs 13 kW legally. In Japanese law, no distinction is made between amateur and commercial regulations. The power limits given above apply to the HF bands. On VHF and higher, the limitation is 50 Watts output.

Q: I understand that the Japanese have another code in addition to the Morse code.

A: Yes, it is called "wabun" and is one of the requirements to obtain a First-class license. When a Japanese operator listens to wabun he writes down Japanese letters on the paper, not English. When you first listen to wabun it sounds like ordinary Morse until you come to some "new" characters—like four dashes, for instance.

Q: Has any American ever passed the Japanese amateur-radio test?

A: As far as is known, no non-Japanese has ever sat for the First-class exam, which would include a wabun exam. But on the other hand, several Americans and others have passed the "denwakyu" or Novice no-code exam. We believe that the first non-Japanese ham to pass the Japanese Novice test was Norman Smith G3HFO in 1970 while he was working for the British embassy here in Tokyo. Since that time several Americans have taken and passed the test, and more recently a New Zealander, Keith Wilkinson ZL2BJR, passed the Second-class test. Definitely a first!

Q: So I assume that those who pass the test can get a callsign and go on the air.

A: No, they cannot! At this writing, only Japanese citizens can receive a station license and callsign. Passing tha test gives one only an operator's license, which you could obtain by showing your ham license from your own country if you happen to be American, German, Irish, or Finnish. (So why bother with the Japanese test?) You still need to find a club station to operate. But that may all be behind us by the time you read this, as we soon may have a full reciprocal agreement with Japan.

Q: It is pretty well known that the Japanese are generally law-abiding citizens, so based on that information I would assume that there are not many violations with regard to amateur-radio operators in Japan. Is that right?

A: There are some problems. I am told that many First-class operators apply for low power to escape a station inspection, then operate with 2 kW or more. Also, there is a lot of repeater jamming. Deliberate jamming, apparently. Also, we often observe out-of-band operation on the 40-meter band, which seems to be deliberate as the operators use fake or comical callsigns. The percentage of bad apples is probably very low, but the repeater jamming has really gotten out of hand. We are told that English-speaking hams are special targets for these jammers. This seems to be true. We also have heard singing, dirty talk, and sex tapes on 2 meters from time to time. (Some people cheer them on.) Then, too, there was a problem when Owen Garriott orbitted this part of the world, bringing the jammers out in force. Japanese country-style "enka" music was heard on one of the downlink frequencies, ruining it for everyone. It was a lot of fun. Generally, Japanese hams have a good reputation on the OX bands and are known for their good manners and good operating techniques.

Q: Who is tha president of the JARL?

A: Shozo Hara JA1AN is the president of the JARL. He is 57 years old and has been JARL president for 14 years.

Q: Can I save money by buying a *rig in Japan and bringing it home?*

A: Yes, if you hand-carry it with you. But be sure the rig you buy has an English manual, that the warranty is good in your country back home, that it has taps for 110/120 volts, and in the case of a 2-meter rig, that it covers the entire band and not just 144 and 145 (Japan frequencies). Incidentally, since the companies went to a lot of trouble to set up dealerships in the US and other countries, they prefer that you buy in your own country through those dealers.

Q: I'd like to stay in a Japanese inn, called "ryokan," in Tokyo. Can you recommend one to me?

A: We're not in the travel business, and since we live here we don't need to look for a ryokan in Tokyo to stay in, but I understand there are some inns in Tokyo that cater to foreigners. The information desk at the New Tokyo International Airport can provide you with information. Incidentally, the Japanese hot baths are very good for arthritis sufferers like myself. Outside of Tokyo at the various resorts you can find many beautiful inns that you might enjoy. Generally, supper and breakfast are included in the price, which ranges from $40 to $300 a night, per person!

Q: Is English understood widely in Japan?

A: No, not really. You will have no problems at international hotels and restaurants, but outside of that you're on your own.

Q: What one piece of advice would you give to a person coming to Japan as a tourist?

A: Bring large buckets of money! Prices are high here.

LIBERIA

Brother Donard Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
PO Box 1005
Monrovia
Republic of Liberia

How would you like to know all the amateurs in the United States?

Well, in Liberia the amateurs all know each other. When a new call is heard on the air, all the hams want to know who he is, where ha lives, where he came from, and what ha is doing in Liberia. It ia not unlike many small communities in tha States. There is one exception, though. Here the new amateur is always welcome and any doubts will be erased on his first contact.

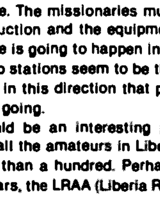
The country, from its northwestern tip to its southeasterly point, runs about three hundred miles, and it is about the same diagonally from southwest to northeast. But in area, the country, roughly rectangular, is quite a bit smaller. Liberia is divided into nine counties. The most densely populated is Montserrado (EL2) in which is found Monrovia, the capital city and the greater part of the Firestone Rubber Plantation. More than half of the hams in Liberia operate from Montserrado County, so many of the amateur operators around the world get the idea that Liberia is EL2-land. Most of the radio amateurs in Liberia are expatriates, and in the Monrovia area most of them are either American or German. The Americans are associated with the embassy, with the Voice of America, or with the administrative offices of various American government activities. Also, a number of Americans are engaged in hospital and dispensary work and in education. The Germans, for the most part, are engineers.

Nimba County (EL8) has seven amateurs and all of them are missionaries. Bong County (EL7) has four amateurs. They are engineers operating an iron-ora mine. Grand Cape (EL9) has four amateurs who are missionaries. Grand Bassa (EL1) had two. One of them has left, so in that county the count is down to one. Sinoe (EL3) has none. Maryland County (EL4) has one. Lofa County (EL5) has four. Grand Gedah (EL6) has one, and all of these are missionaries.

Some of the missionaries up and down Liberia use commercial-type fixed-frequency radios for their business communications and use the amateur radio to keep in touch with their friends both in Liberia and in their homelands. Communication in this country is difficult or nonexistent except for the radio. In the outlying areas there is either no electrical power at all or it is supplied for a few hours a day. Radios in those areas are operated on battery power.

The problem of building amateur radio among the natives becomes more understandable. The missionaries must supply the instruction and the equipment, otherwise little is going to happen in this area. Area club stations seem to be the answer and it is in this direction that present efforts are going.

It would be an interesting project to contact all the amateurs in Liberia. There are less than a hundred. Perhaps one of these years, the LRAA (Liberia Radio Amateur Association) will issue an award for such an accomplishment. Wouldn't it be nice to have a beautiful certificate on the wall of your shack stating that you have contacted every ham in Liberia?



MEXICO

Mark K. Toutjian XE1KMT
Apartado Postal 42-048
06470
Mexico, D.F.

NEW 10M-FM TO 2M-FM LINK!

I was recently informed by William Alzaga Ch. XE2WAL, here in Mexico City, that a new link from 10m FM to 2m FM is being installed and used through the Satellite Radio Club repeater (147.030/147.630) so that local hams can operate

Continued on page 152

David A. Smith W8YZ
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Monroe MI 48161

How to Have a Sunny Field Day

When Michigan hams turned to solar power, they got more than they asked for. Does success mean anything?

Our club, The Monroe County Radio Communications Association, has always earned the natural-power bonus points at Field Day by hand-cranking a generator and using the power produced to operate a 5-Watt CW QRP rig. Believe me, it takes real concentration on the handles when the operator keys down to adjust the antenna tuner.

Well, to a radio ham who is always looking for a better way to improve a station, it seemed that there had to be a better way to earn the bonus points. I had seen a demonstration of photovoltaic power at a local hamfest and it sure seemed like a better way to go.

Battery box, charge controller, and solar panel with (from left to right) Paul DeNapoli WD8AHO, Lee Loose KD8DA, Dave Smith W8YZ, and Ron Loveland KA8RNE.

We contacted Mr. Paul DeNapoli WD8AHO, the Communications Director for The Encon Corporation (27600 Schoolcraft Road, Livonia MI 48150, (313)-523-1850). Paul was glad for the opportunity to demonstrate his company's products. To our surprise, he told us to plan on running at least one solid-state rig of the 200-Watt class for the entire period on equipment that he would loan us for demonstration purposes. We expected only to run a handheld on 2 meters for five contacts.

We took Paul at his word. One of our members supplied an Icom IC-740 for the project. This station was to be operated on both 80-meter phone and CW with capability for other bands as well. We planned to use it around the clock.

The equipment provided by Encon was four Exide renewable-energy, deep-cycle, 6-volt batteries connected in series parallel, 12 V dc @ 370-Ah storage, an Encon charge controller, and three Encon solar panels each measuring 17 by 42 inches. The latter were mounted on an aluminum framework and pointed south under Paul's direction. We expected to need to rotate the framework to follow the sun, but Paul explained that this was not needed.

We started Field-Day operation using the mad-scramble technique which permits 27 hours of operation. The solar installation proved to be easier to set up than a gas generator. Paul brought the whole installation to our site in the back of a compact automobile. All that was needed was to make several connections to the rig and batteries with #10 copper wire and aim the panels south.

We were quickly able to make the needed 5 contacts

for the natural-power bonus points. Everything was working fine and we continued to operate the station full bore on both phone and CW.

The charge controller supplied by Encon had a battery voltmeter as well as a separate charge and discharge ammeter. The voltage remained at a steady 13.4 volts while the charge indicator indicated between 1 and 6 Amperes to charge. This was due to the periodic cloud coverage. Under full sun, we had 6.6 Amps. The output ammeter fluctuated wildly between 1 and 20 Amperes while we were operating!

The station was on the air all night and of course there was no charge current to the batteries. The voltage dropped to 12.6 volts. This was quickly recovered, however, with the batteries topping off at full charge by 10 am. The charging current from the panel array was 6.6 Amperes.

It became clear at this point that the three panels and batteries were large enough to run at least one more rig. We had failed to consider how low the full-current duty cycle is with solid-state amateur gear, even during a contest.

Considering the advantages of solar power for Field Day, one must think beyond multipliers and bonus points. For example, there were a couple of times when the solar station was the only station operating, once because of a breakdown of a generator when a spark plug fouled and another time when there was a fuel-line blockage. It was clear that the solar installation is far superior for emergency applications. Also, there was no ignition noise to contend with when the generator failed. The "ears" on the solar station got even better.

This demonstration of amateur radio was well covered by the press with all area papers giving it attention. The county's general-coverage paper, *The Monroe Evening News*, did a half-page photo story on our Field Day with particular emphasis on the solar-power aspect. This publicity got a lot of attention for our hobby and provided many opportunities for the club members to explain to their friends the hobby with its unique emergency capabilities.

One response is most interesting. The local power company contacted the club and offered to "do whatever is needed," including setting poles and transformers free of charge and providing free power, for any future field activities of the club. They wish to emphasize the dependability of commercial power.

In Michigan, users pay a penalty for "excess use" of electricity. Consumption beyond 810 kwh is charged at a rate of 14¢ a kwh. This means that any optional use of electricity such as amateur radio must be considered to cost the penalty rate. Nearly every ham I know has a part of his electrical consumption in the "excess" category; any home application of photovoltaics must take into account ham operating at the penalty rate.

Also, hams who are especially interested in emergency preparedness would do well to consider the potential of photovoltaic power for their home stations. After all, a widespread outage of commercial power would have no effect on an operational photovoltaic system, while the demands upon a ham who was needed to send health and welfare traffic might well include cleaning spark plugs and gas lines of infrequently used equipment before the traffic could be sent. Clearly, there is an advantage in using something that works every day of the year. ■

View of charge controller and battery box.

✓See List of Advertisers on page 130

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Painless Op-Amp Filter Design

Custom applications can be easy. Just follow this step-by-step guide to a perfect triple op-amp filter.

The triple op-amp audio filter has become a standard, not only in amateur circles but in commercial design as well. Easy to design and nearly foolproof in construction, the various configurations of this filter have found their way into a large percentage of existing ham shacks, either hidden within a transceiver or sitting on the speaker as an audio adjunct. Numerous small companies offer post-receiver audio units using from one to eight filter units.

Even though popular, op-amp filters seem to confuse most ham builders. Despite the low cost of parts, few hams build their own. A simple but effective single filter with a bandpass of between 100 and 200 Hertz would cost about $10.00 for parts, excluding the case and power supply, which together might double the cost. This is a small investment in selectivity, considering what one might learn in the process. Still, there are few takers.

Part of the problem stems from the volume of material that has been written about triple op-amp filters. There are at least three semi-distinct configurations of these filters, but only two different models. However, because designers recast schematic diagrams in different ways, the average ham comes to believe there may be dozens of models. Going even further, different designers choose different circuit values without explaining their choices; the variations seem to grow without limit and without any clear sense. The available books on filter design mire the ham builder in theoretical design math while simultaneously claiming simplicity. There is *some* necessary math to designing a personally-satisfying triple op-amp filter, but it is straightforward hand-calculator stuff.

For the CW buff, most of the existing designs have limitations. Many are fixed-frequency units allowing no tuning to please the ear. The units that permit tuning tend to cover 300 to over 3000 Hz, a fine range for the SSB fan who can use high- and low-pass capabilities built into the filter, but extraneous for CW. A filter that covers a span ranging from 300 to 400 Hz at the bottom to perhaps 1200 Hz at the top would reach two goals. First, the filter would cover the main receiver passband for CW, which runs (depending upon preference) from 400 to 800 Hz wide. Second, the filter would spread its narrower tuning range across the filter frequency dial, permitting the operator to find more easily the desired signal. Unfortunately, most home-brew designers have merely guessed their way into a tuning range.

There is a very direct and easy-to-follow procedure for designing triple op-amp filters in the ham shack. Not only will the procedure ensure a filter that works, but also it will allow the builder to refine the filter's tuning range to his desires. The following notes present a procedure used to design several dozens of different filters for experimental, evaluative, and operational use, and those who have tried the procedure claim they

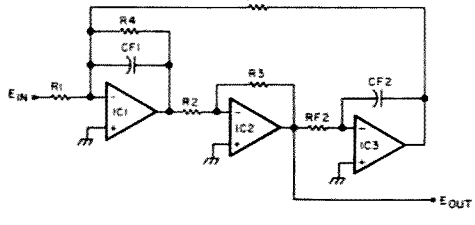


Fig. 1. The basic bi-quad filter.

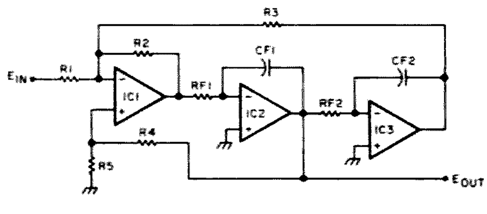


Fig. 2. A basic state-variable filter (−SVF).

have finally made a filter that works and that they like. The procedure even includes steps that show how to let a hand calculator do most of the work.

Some Op-Amp Basics

There are many triple op-amp filter designs but only two fairly distinct types. Unfortunately, the history of op-amp filter terminology has obscured the subject. Originally, the mathematical methods of designing filters gave rise to the name "bi-quad" as a label for all designs. Newer derivations yielded the name "state-variable filter." For some, these names refer only to the design methods; for others, they refer to circuit configurations. At the risk of arousing the wrath of some professional designers, let's follow the latter course.

The bi-quad (or B-Q) appears in Fig. 1. Note that the input op amp is an integrator, as is the third op amp. (Theory aside, an integrator circuit is little more than an op amp whose feedback is provided by a capacitor rather than a resistor.) The middle op amp is an inverter, and we take our bandpass output from this stage. Feedback from the first and third stages is fed back to the first stage input. By controlling the amount of feedback from one of these stages, the first, we control both the gain and the Q or selectivity of the filter. The components marked RF1, CF1, RF2, and CF2 control the frequency of the filter.

Fig. 2 shows the other triple op-amp filter design. The state-variable filter (or −SVF, with the minus sign to be explained very soon) also consists of two integrators, but this time in positions two and three, with a summing amplifier as the input stage. Feedback from the integrators combines with the input signal at the inverting or negative input of the first op amp. We control the gain and Q of the filter by the ratio of resistors R4 and R5, and we set the frequency by the components marked to correspond to those in the B-Q filter. Bandpass output comes from the middle stage, this time an integrator. Unlike the B-Q filter, the −SVF design provides high-pass and low-pass outputs, but at different signal levels than the bandpass output.

The −SVF filter has a near twin which we can call the +SVF. Fig. 3 shows the configuration. The major difference between the SVFs is that this version feeds the input signal to the non-inverting or positive input of the summing op amp. (The reason for the labels +SVF and −SVF should now be clear.) Gain and Q feedback also return to this pin, now being controlled by the ratio of R4 to R1. Although this filter belongs in the SVF family, some of its components require slightly different values from its brother, and the gain vs. Q characteristics will differ. Otherwise, it works perfectly well.

The B-Q and SVF filters have different properties that, for various needs around the shack, give one advantages over the other. First, both SVF filters will have a constant Q and gain throughout their tuning ranges. This means that the bandwidth, when measured in Hertz, will increase as the filter frequency increases. In contrast, the B-Q filter has a constant bandwidth in Hertz, but consequently increases in Q and gain with frequency. For fixed-frequency filters, this phenomenon is meaningless, but for tunable filters, it is important. The constant output of the SVF designs makes follow-up amplification simple. However, every SVF section (i.e., three op-amp filter) requires a dual potentiometer to change RF1 and RF2 together.

The B-Q filter is tunable in the same way but may also be tuned by changing just RF1. Since, like virtually all other filter sections, these filters will ring if the Q is very high, we can cascade two lower Q B-Q sections for a sharper bandpass using only one dual pot. Dual pots are hard enough to find; four-section pots in audio (log) taper are nearly impossible to come by, being either inaccessible or very expensive (which amounts to the same thing for most of us). A newer variety of op amp, the operational transconductance amplifier (OTA), promises to relieve us of these problems, but few practical ham designs using the device have yet to appear.

Notice that there is no clear winner in the contest between the B-Q and the SVF filters. Rather, we must design around their limitations. For example, we can overcome the gain change of the B-Q filter by making the Q resistor, R4, variable, or by following the filter with a limiting amplifier such as the one in Fig. 4. This is the W4MLE variable-compression version of the N6WA Audio Elixir. (See *73* for September, 1979, p. 116, and November, 1982, p. 32.) Until OTAs become more common, there is no way to solve the multiple-pot problem of cascaded SVFs; however, for most work on CW, a single-section, moderate-Q filter requiring just one dual pot will do wonders. A Q of 20 theoretically yields a half-power bandwidth of just 30 Hz at 600-Hz center frequency. Even allowing for low-precision components, we do not need excessively high Q filters to enhance CW. In practice, design Qs in the range of 15 to 20 will yield −6 dB (half-voltage) bandwidths in the 100-to-120-Hz range for a 600-Hz center frequency.

Designing Your Filter

In Fig. 1 through Fig. 3, components having comparable duties have the same designation. For all designs, the frequency-determining components are the same although differently placed. R2 and R3 provide feedback and can be treated as alike in all three cases. In the −SVF design, R1 equals the feedback resistors, while in the +SVF version, it will be half their value. In the B-Q, the input resistor can equal the feedback resistors

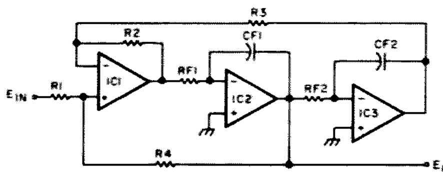


Fig. 3. A basic state-variable filter (+SVF).

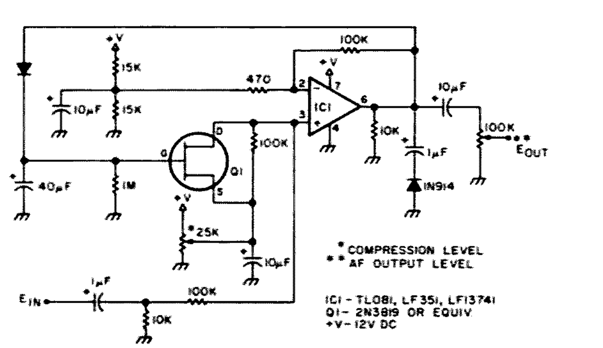


Fig. 4. A limiter/compressor for post-filter amplifying.

Filter Type	State-Variable Inverting Input	State-Variable Non-Inverting Input	Bi-Quad
Schematic	**Fig. 2**	**Fig. 3**	**Fig. 1**
Frequency	$F_c = 1/2\text{pi}R_fC_f$	$F_c = 1/2\text{pi}R_fC_f$	$F_c = 1/2\text{pi}R_fC_f$
Frequency-determining resistors	RF1 = RF2	RF1 = RF2	RF1 = RF2
Frequency-determining capacitors	CF1 = CF2	CF1 = CF2	CF1 = CF2
Bias resistors	R1 = R2 = R3	R2 = R3 = 2R1	R1 = R2 = R3
Q-determining resistors	R4 = R5(3Q − 1)	R4 = R1 (2Q − 1)	R4 = R1Q
Q	Q = (R4 + R5)/3R5	Q = (R4 + R1)/2R1	Q = R4/R1
Gain ($A_o = E_{out}/E_{in}$)	$A_o = Q$	$A_o = 2Q$	$A_o = Q$
Non-inverting input bias resistors	N/A	Fig. 6, Norton amplifier configuration only $R6 = R5 = 2R_f$	N/A

Fig. 5. A comparison of filter design relationships.

or vary somewhat from their value according to the needs of the Q relationship. Only in the −SVF design does Q leave the input resistor unaffected, being determined by the relationship between R4 and R5. In the other designs, the input resistor will be a compromise (if needed) between the dictates of Q and the desired situation of having the input resistor correctly related to the feedback resistors.

This discussion may make designing a filter appear difficult. In fact, design is quite easy if done according to a straightforward procedure. Taken step by step, the procedure almost ensures satisfying success. Let's start with some basic relationships, as shown in Fig. 5.

This table reveals where the differences between designs will occur. Calculating R4 will be slightly different for each case. Notice that the +SVF filter has twice the gain of the other designs for a given Q. This may or may not be an advantage. For a filter inserted between the detector and audio amplifier of a receiver, the doubled gain with a low-level input can be useful. For post-receiver use with normal speaker input to the filter, the lower gain of the −SVF and B-Q designs may be more than we need. In all cases, we should have a means of varying the input level.

Aside from these points, design of the three-filter versions will be nearly identical. The first step is to think about the ICs we will use. The LM324 is perhaps standard for both single- and dual-voltage supply applications. Its current requirements are relatively small and it is easy to handle. The TL084 is an FET input version with an identical pinout; its current requirements are even less. The 3900 Norton amplifier also is popular in single-voltage designs, but its biasing is different. Fig. 6 shows the basic configuration of the +SVF design with Norton biasing. Notice the additional formula that sets the values of the bias resistors to the non-inverting positive op-amp inputs. Otherwise, our work will be the same as for regular op amps.

Much of the available literature on filters is still written in terms of the relatively high current 741 op amp. Hence, about the highest value shown for feedback resistors is 10k. In fact, 10k should be about the minimum value for R1, R2, and R3. Something approaching 100k is more appropriate, although we will not freeze that value at this point. Instead, we will start by selecting an op amp and the desired frequency range.

This differs from textbook procedures, but for good reasons. First, the ham builder ordinarily has access to components with 5% or 10% tolerances rather than the 1% and .1% tolerances commercial designers prefer. Consequently, absolute peak performance from ham models of op-amp filters is not possible. Very good performance is possible and practical. Since we will aim at good though imperfect performance, we can take a few liberties with absolute precision at some points to gain better precision at points more important to hams.

Second, one of the most evident shortcomings of home-brew filter designs is the fact that tuning controls for frequency and Q rarely cover the most desirable ranges. The techniques for designing filters are easy, but almost never described.

Third, the current crop of op amps available for filter work is very forgiving when we compare the precise operating level to overall filter performance. Hence, we can set our own priorities when establishing a design procedure. In fact, feel free to modify the following procedure to suit personal needs and desires.

While the procedure involves twelve individual steps, they cover only three areas of concern: setting the frequency or tuning range of the filter, ensuring correct feedback, and setting the selectivity and gain of the filter. With a few reservations noted in the procedure steps, these are almost independent design operations. To make the procedure more thoroughly clear, let's step through it, working an example as we go along.

Twelve-Step Filter Design

Step 1. Select an op amp.

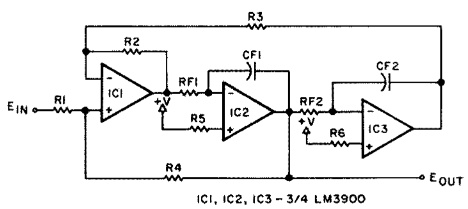


Fig. 6. A +SVF filter using the 3900 Norton amplifier.

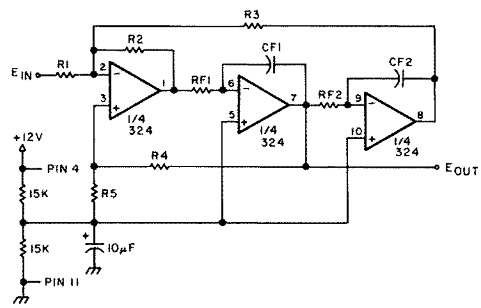


Fig. 7. Setting up the 324 for filter design.

In this case, let's use the reliable LM324.

Step 2. Select a circuit. We can start with the −SVF of Fig. 2 and later see what happens when we convert the design to the other circuits.

Step 3. Choose a power supply. In this example, we have chosen a single 12-volt source. This forces us to provide a voltage divider to feed the positive input lines that we would directly ground if we used a dual supply. Fig. 7 shows the basic configuration of our circuit, with the 324 pins and power connections drawn in.

Step 4. Choose a frequency range. For CW, let's try 300 to 1200 Hz.

Step 5. Find the center frequency, F_c. This is our first calculation. Let k be the ratio of the highest (F_{hi}) and lowest (F_{lo}) frequencies of our chosen range. Then: $k = F_{hi}/F_{lo} = 1200/300 = 4$.

The square root of k is 2 (and let's call this ks). If we have not made a mistake, then $F_c = F_{hi}/ks = F_{lo}ks = 1200/2 = 300 \times 2 = 600$ Hz.

This is the design center of our filter. Since the filter is tunable, let's next turn to the task of being sure it tunes exactly the range we want it to tune.

Step 6. Choose a dual pot to tune the filter. This is a practical decision. Since we have already said that we would like to keep the feedback resistors well above 10k and hopefully near 100k, a dual 500k pot would be nice. Dual 100k audio-taper pots may be more accessible, so let's see what happens if we use this value.

Step 7. Calculate R_{hi} and R_{lo}. In order to limit the tuning range to specific values (e.g., 300 to 1200 Hz), we will need a fixed resistor and a pot in series to make up each of the frequency-controlling resistors. R_{hi} will be the needed resistance when the frequency is the lowest, and R_{lo} will be the resistance at the highest frequency.

We know something about these values, even though we have not yet selected a capacitor. First, we know that their difference will be 100k, the value of the pot. Hence, $R_{hi} - R_{lo} = 100k$. We also know that $R_{hi} = 4R_{lo}$, since the ratio of low to high frequency is 4:1. (Note: If we hold the capacitance constant, as we will do with a fixed-value unit, the frequency and resistance will vary inversely with each other, i.e., $F_{hi}/F_{lo} = R_{hi}/R_{lo}$.)

Knowing the two relationships between the highest and lowest resistances lets us substitute and solve for R_{lo}. Since the ratio of the resistances is 4:1, then $R_{hi} = 4R_{lo}$. In the difference formula, we now can say that $4R_{lo} - R_{lo} = 100k$, or $3R_{lo} = 100k$. Dividing 100k by 3, we get $R_{lo} = 33.3k$. Since the highest resistance is 100k higher, $R_{hi} = 133.3k$. As a check, we can use the other original formula and let $R_{hi} = 4R_{lo} = 4 \times 33.3k = 133.2k$.

I have carried out the calculation to more precision than we can possibly get with real components to show how good the method is. In fact, since real pots are often shy of 100k by as much as 10%, it is wise to have a pot in hand before working out a design. The decimal places might get long, but rounding to the nearest whole number for resistors and keeping k and ks to no more than two decimal places will give perfectly good design accuracy.

We now know the fixed series resistor for RF1 and RF2 will be 33k, with the 100k pot making up the rest of the resistance. If we discover that our dual pot does not track and can determine by how much it is off, we might make one of the two fixed resistors a 50k trimmer pot. (Adjustment of trimmers in the frequency-determining circuits of a filter is best done with the circuit wired but the op amp out of its socket, using a precise ohmmeter. Accurate adjustment with the circuit in operation requires a scope with frequency-scanning capability. Output-level readings taken on an ac/audio voltmeter can be misleading.)

Step 8. Calculate capacitors CF1 and CF2. At all frequencies, the resistance will equal the capacitive reactance. Hence, the standard formula for calculating capacitance from frequency and reactance becomes $CF1 = CF2 = 1/2piFR_f$. In this case, start with either end of the tuning range. For the example, use 300 Hz, where the resistance is 133k. If your calculator has a 1/X key, you can just multiply all the denominator numbers together and then hit the inverse key. The answer is likely to appear in exponential notation. For example, $C_f = 1/(2 \times 3.14 \times 300 \times 133{,}000) = 3.99 \times 10^{-9}$.

We need to convert this to either microfarads (10^{-6}) or picofarads (10^{-12}) to see what capacitors we should purchase. 3990-pF or .04-uF capacitors will do the job. We can parallel some 5% polystyrene capacitors to hit 4000 pF fairly closely. Given the fact that we can rarely buy the exact value that the formula says we need, we should design the frequency range of the filter with an extra 5% on either end to allow for the slight range shift our approximations will produce.

We can check our work by calculating the two frequency-determining capacitors from the other end of the range. This time, $C_f = 1/(2 \times 3.14 \times 1200 \times 33{,}000) = 4.02 \times 10^{-9}$, or about 4000 pF again. Because we used pi to only two decimal places and dropped the last 300 Ohms off the resistance values, the answers diverge by about 1%, well within the 5% component tolerance. Note that had we used the 500k pot we considered at the beginning of the example, our capacitors would be about one-fifth the present value. Some builders have difficulty obtaining 5% capacitors in the higher values and may want to use the larger pot in order to combine it with capacitors in the 800-pF range.

Step 9. Calculate the resistance at the center frequency, F_c. Since the resistance at center frequency will equal the reactive capacitance, $R_{fc} = 1/2piF_cC_f = 1/(2 \times 3.14 \times 600 \times 4 \times 10^{-9}) = 66{,}348$ Ohms. This is the resistance value of the frequency-determining resistors at the design center of the filter. We will use this figure in a very broad way to determine the remaining resistors in the filter. Most filter-design manuals scale a filter from an initial assumption of equal value resistors throughout as much of the design as possible. On this assumption, R1 through R3 should equal the center-frequency resistance, and R5 should approximate it, if possible. Similar assumptions apply to the other filter designs, with adjustments for values that must differ.

In practice, using components readily accessible to amateurs, the assumption is not very important as long as filter resistor values fall within the range that permits the op amps to perform well. Values from 10k to 100k have been used with no specifically noticeable change of performance. As a rule of thumb, try to let the feedback resistors fall within a 2 to 1 or 3 to 1 ratio of the center-frequency resistance.

Step 10. Determine the feedback and input resistors, R1 through R3. On the basis of the previous calculation and discussion, 68k resistors appear to be the closest value to the calculated center-frequency resistance. In practice, 100k resistors do not change the filter performance. What is important is to use the same value for all three. Since 100k is a nice round value found in most ham junk boxes, let's use it. No-

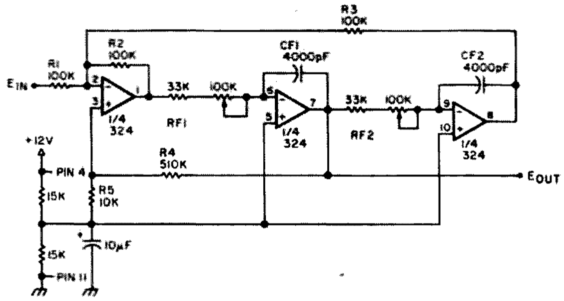


Fig. 8. A fixed-Q −SVF filter.

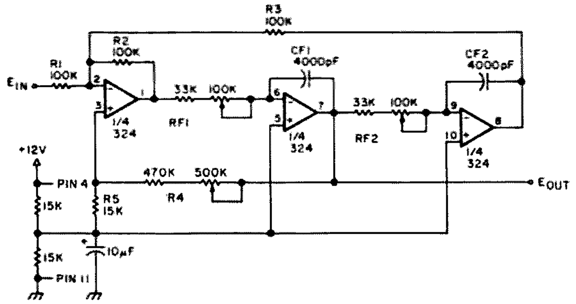


Fig. 9. A variable-Q −SVF filter.

tice that, like many ham building decisions, the grounds for our choice have little relationship to theory. If our value does not work for some reason, we have another value to try.

Step 11. Select a value for Q and choose the Q-determining resistors, R4 and R5. Since both resistors affecting Q and gain are independent of the input resistor, we have more latitude in choosing values than with the other two designs. For CW filters, there is rarely a need for a Q greater than 25, and the range of 10 to 20 will generally produce sufficient selectivity without ringing. For greater selectivity, we should use identical successive filters which will give us a steeper bandwidth curve and greater ultimate rejection on unwanted signals. As a rule of thumb, using 5% and 10% components, I anticipate that the half-voltage (−6 dB) bandwidth will approximate $3F_C/Q$, about 50% wider than theory indicates. For the SVF filters, bandwidth in Hz will vary directly with frequency. Thus, if I choose a 100-Hz bandwidth for the 600-Hz center frequency, it will vary from 50 Hz at the 300-Hz end of the range to 200 Hz at the 1200-Hz upper end of the tuning range. If this bandwidth is acceptable, then $Q = 3F_C/BW_{fc} = (3 \times 600)/100 = 18$. Let's see what happens if we use this figure.

From the formulas governing the −SVF filter, $R4 = R5(3Q-1)$. For our case, $3Q-1 = (3 \times 18) - 1 = 53$, and $R4 = 53R5$. If we let R4 $= 100k$, then $R5 = 5.3$ megohms; use either 4.7-megohm or 5.1-megohm standard resistor values. In fact, we can change the values proportionately by factors of ten without disrupting filter performance. Values of 10k and 510k work well and may be easier to find. A rule of thumb is to let R4 be the highest easy-to-find value that permits R5 (or R1 in the other two designs) to approach its proper theoretic relationship to the other resistors. However, other considerations may enter into the final selection. Fig. 8 shows our completed fixed-Q design.

One major consideration is whether we wish to be able to vary the Q of the filter and thereby to broaden or narrow the bandwidth over some useful range. For example, we might wish to have a Q ranging from 10 to 20 for this design. At $Q = 10$, the resistor ratio $(3Q-1)$ will be 29, and at $Q = 20$, the ratio will be 59. Suppose that we have a 500k pot we wish to use to vary the Q. Since we will not vary the Q to nothing, we will need a series resistor with the pot to make up R4. We know that the value of R4 at $Q = 20$ will be the series resistor R_S + 500k, the highest value of the pot. At $Q = 10$, R4 will be just R_S, the value of the fixed series resistor. At the higher Q, $R5 = (R_S + 500{,}000)/59$, while at the lower Q, $R5 = R_S/29$. We can solve for the series resistor by letting $R_S/29 = (R_S + 500{,}000)/59$. Cross multiplying, we get $30R_S = 29 \times 500{,}000$, or $R_S = 1{,}450{,}000/30 = 483{,}333$ Ohms. This is the series resistor to go with the 500k pot for R4. $R5 = R_S/29 = 483{,}333/29 = 16{,}667$ Ohms. (As a check, $R5 = (483{,}333 + 500{,}000)/59 = 16{,}667$.) We can choose a 15k or 18k resistor for R5 and a 470k or 510k resistor for R_S, respectively. Exactness will not matter too much here since we will tune the control for best reception rather than for some specific value of Q. Fig. 9 displays our completed variable-Q design.

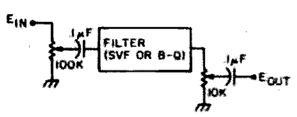


Fig. 10. Filter input- and output-level controls.

Step 12. Consider the gain. This step does not require special calculations, but it does bring the matter of gain to your attention. For the −SVF design, gain will equal Q. If you design a fixed-Q filter, you can accommodate the filter gain with preceding and succeeding level controls, as shown in Fig. 10. Set the input-level control so that the strongest signal will not drive the filter to clipping. A scope will show this as a sharply flattened sine wave. Since the voltage gain will be considerable, the filter may drive the succeeding stage too hard, causing distortion in the amplifier feeding the speaker or phones. We can kill the unwanted voltage with another trimmer set to hold the amplifier relatively distortionless at full volume.

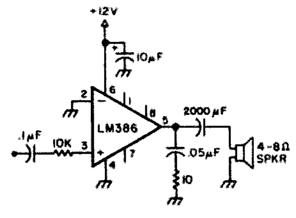


Fig. 11. A simple post-filter amplifier for speaker or phones.

If the filter has a variable-Q control, then its gain will also vary. To avoid the need for constant volume-control adjustments, the compression amplifier shown in Fig. 4 should follow the filter and precede the output amplifier. With the values shown for the compression circuit, a normal CW signal will leave the speaker quiet between dots and dashes. The circuit needs no input-setting pot, and the output-level control serves the same function as the filter-output control in Fig. 10.

These 12 steps complete the design phase of the work. The next step is to breadboard a model, verify its operation, and finally construct a permanent version complete with case and power source. Robbing power from the receiver and installing the filter in either the receiver cabinet (especially if inserted between the detector and audio stages) or the speaker cabinet (along with an audio amplifier such as the LM386 circuit shown in Fig. 11) is one popular way to handle final construction. However, to avoid cabinet and circuit modifications, you may

wish to make the filter a self-contained unit.

Additional Procedures—+SVF and B-Q Designs

The first eight steps of the procedures just outlined are identical for all three filter designs. Nothing changes until Step 10, selection of the input resistor, where we have only a minor modification for the +SVF filter. R1 should be half the value of either R2 or R3 if we wish to have the relationship of Q and gain follow the formulas given with Fig. 5. Other ratios are possible, although the input resistor should not be greater than the feedback resistors. The gain will change but remain constant across the tuning range.

Let's look more closely at the final steps of the procedure, customizing them for each particular design. First, the bi-quad filter:

Step 11: B-Q. Select a value for Q, and choose the Q-determining resistors. In the B-Q design, the input resistor, R1, interacts with R4 to determine Q and gain. Having selected an input resistor, R4=QR1. Selecting Q follows the same guidelines given for the −SVF design, with the proviso that Q will vary across the tuning range, since bandwidth in Hertz is constant. Using our −6-dB (half-voltage point) rule of thumb, we can design with the formula $Q=3F_c/BW$, where BW is the desired bandwidth in Hertz. If we wish about 100 Hz, then Q = (3 × 600)/100 = 18. RV = 18R1 = 18 × 100k = 1.8 megohms, a usable value. However, with very little change in performance, we can reduce both R1 and R4 as long as we keep them in the proper ratio. Fig. 12 shows the full results of our design work.

We can vary the Q and consequently the bandpass of B-Q filters. We need only make R4 variable. Suppose we wish to vary the Q between about 10 and 20. If R1 is 100k, then R4 needs to be 1 megohm for a Q of 10 and 2 megohms for a Q of 20. We can use a one-meg fixed resistor in series with a one-meg pot for R4, and the problem is solved. Fig. 13 shows the changes necessary for variable Q.

Step 12: B-Q. Consider the gain. Variable Q plus the natural gain variability of the B-Q filter makes a compression amplifier almost mandatory. However, the 100-to-1 compression capability of the audio elixir circuit will more than cover the situation. The natural gain variability of a fixed B-Q filter with the 300-to-1200-Hz tuning range is about 4 to 1, while Q variability expands the total range to 40 to 1, well within the amplifier's capabilities and with room to spare for audio signal strength variations.

The B-Q filter has one special property not shared by either SVF design. You can tune the B-Q using only RF1, leaving RF2 fixed for F_c. The variable resistor, however, will change frequency only with the square root of the resistance change, meaning that the pot will have to have a much wider range to cover the chosen frequency range. Since the frequency limits in the example are $2F_c$ and $F_c/2$, the resistance range must be $R_{fc}/4$ and $4R_{fc}$. In this design, R_{fc}=66,348 Ohms. The lowest resistance (for the highest frequency) will be 66,348/4=16,587, while the highest resistance (for the lowest frequency) will be 66,348 × 4=265,392. The difference is 248,805. A 250k pot in series with a 15k fixed resistor will form a satisfactory RF1. An audio taper or reverse log pot is mandatory in this application, since even with a log pot the frequency will compress at one end of the scale.

In this example, we were fortunate to wind up with a required value close to an existing potentiometer value. For designing a single pot B-Q filter from scratch, we can begin at Step 6, choosing a pot to tune the filter. Let's select a 500k pot and see what happens.

Step 7: B-Q, single pot. Calculate R_{hi} and R_{lo}. Since frequency will vary as the square root of resistance changes, the total resistance change will be k^2, where k is the frequency ratio. Since k=4 (1200/300 Hz), $k^2=16$. $R_{hi}=16R_{lo}$. We also know that $R_{hi}=R_{lo}+500k$. Now we can solve for R_{lo}: $16R_{lo}=R_{lo}+500{,}000$, or $R_{lo}=500{,}000/15=33{,}333$ Ohms. This is the value of the fixed-series resistor. $R_{hi}=33{,}333+500{,}000=533{,}333$ Ohms. As a check, 533,333/16=33,333 Ohms.

The resistance at center frequency (and fixed frequency-determining resistor RF2) will be $R_{hi}/4=4R_{lo}$= 533,333/4=33,333 × 4= 133,333 Ohms. We can use 100k and 33k resistors in series or use the nearest standard value.

Step 8: B-Q, single pot. Calculate capacitors CF1 and CF2. This calculation uses the same procedure as in the −SVF filter. Since resistance and capacitive reactance are the same at the center frequency (and we must use F_c for this calculation), $C_f=1/2\pi F_cRF2=1/(2\times3.14\times600\times133{,}333)=1.99\times10^{-9}$. This is about 2000 pF, an obtainable value in polystyrene capacitors.

Determine the remaining values for the filter in the ordinary way. 100k feedback and input resistors appear to be in order, since they vary only a little from the value of RF2. Considerations of Q and gain will be identical to those for the dual-pot biquad design. Fig. 14 shows our new filter.

The SVF filters always require dual pots. Therefore, the only difference between the +SVF filter and the −SVF design concerns Q and gain.

Step 11: +SVF. Select a value for Q, and choose the Q-determining resistors. Q selection for the +SVF is

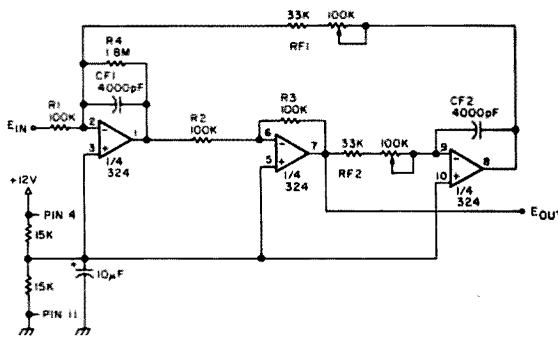


Fig. 12. A fixed-Q B-Q filter.

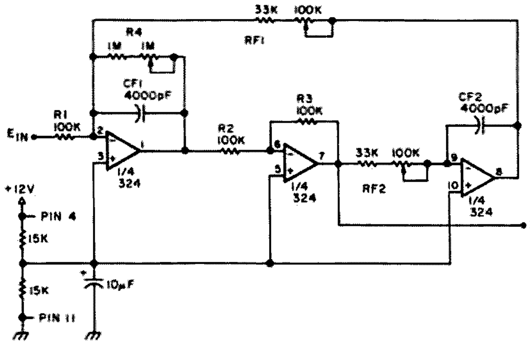


Fig. 13. A variable-Q B-Q filter.

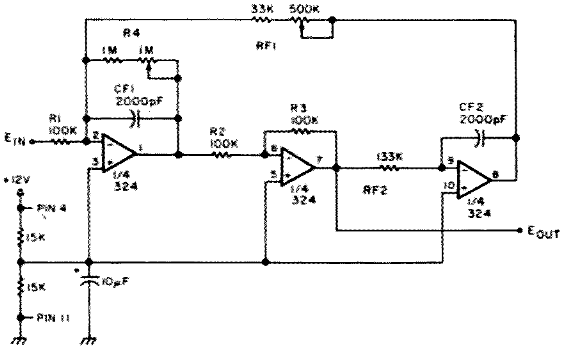


Fig. 14. A single-pot tunable variable-Q B-Q filter.

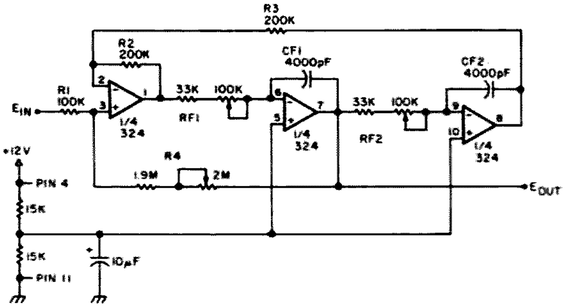


Fig. 15. A variable-Q +SVF filter.

identical to that for the −SVF design. We must make mental note that gain will double Q if we follow recommended resistor relationships. Let Q=18. R4=R1 (2Q−1). If we use 100k resistors for feedback, the R1 is 50k. Many designs use 200k values for R2 and R3, in which case, R1=100k. Let's use this latter value for our design. For a Q of 18, 2Q−1=35, and therefore R4=100k×35=3.5 megohms. 3.3 megohms would work well. For a variable Q of, say, 10 to 20, the maximum resistance value of R4 would be 39R1 and the minimum value would be 19R1. R4 will range from a series resistor value of R_S to R_S+pot, where pot is the potentiometer value we select. Let's try a 2-megohm pot. Then R1=R_S/19 at low Q and (R_S+2,000,000)/39 at high Q. Solving for R_S, we get R_S=38,000,000/20=1.9 megohms. R4 thus becomes a 1.9-megohm fixed resistor in series with a 2-megohm pot. R1=R4/(2Q−1)=3.9 megohms/39=1.9 megohms/19=100k, a desirable value.

Step 12: +SVF. Consider the gain. The gain of this +SVF filter, shown in Fig. 15, ranges from 20 to 40, depending upon the variable Q. Again, following this design with a compression amplifier is a must for easy use.

Construction and Results

All of the designs shown in the examples have been breadboarded to confirm that they will work. In fact, they all work even when some non-frequency-determining components vary by 20% from the design values. Fig. 16 charts the test results. (Always test a design on a breadboard before wiring a final version. If nothing else, the breadboard test will turn up bad components. More important, adjusting the design to more precisely meet your needs is much simpler on a breadboard.)

Construction of the final model can take any form. Perfboard and printed circuit board peform equally well. Layout is not critical with the LM324. The TL084 requires some care to prevent inadvertent coupling, a more serious concern with the very high impedance inputs to each section. One easy way to overcome the problem is to avoid compressing the components into too small a space. Spreading the fixed components at the IC corners in a radial pattern tends to prevent unwanted coupling and makes component replacement simpler. Beyond this, construction is left to individual ingenuity.

Part of the construction ease stems from the low Q of these filters. Most practical filter articles still manage to repeat the virtually useless fact that these designs are good to a Q of 500. At normal CW audio, the bandwidth would be just over 1 Hz, and the filter would ring for a week with just one receiver electron pop, if it was not already oscillating. With normal components, practical Qs of 5 to 25 ensure good stability and

Figure	Filter	Tuning Range	Bandwidth	Q	Output Voltage Ratio	Notes
8	−SVF, fixed Q	330-1250 Hz	25-100 Hz	26	1.08:1 F_{hi}:F_{lo}	3900 pF, 5% C*; reduce R4 from 510k to 330k**
9	−SVF, variable Q	330-1250 Hz	40-75 Hz at (at F_c)	16 to 30	2.5:1 Q_{hi}:Q_{lo}	Reduce fixed-series Q resistor from 470k to 330k
12	B-Q, fixed Q	330-1250 Hz	30 Hz	35 at F_C	1.4:1 F_{hi}:F_{lo}	Reduce R4 from 1.8 megohms to <820k
13	B-Q, variable Q	330-1250 Hz	30 Hz at Q_{hi} 50 Hz at Q_{lo} (at F_c)	35 21	2:1 Q_{hi}:Q_{lo} 2.8:1 total change due to both F and Q	Reduce fixed series Q resistor from 1 megohm to 470k
14	B-Q, single pot, variable Q	350-1330 Hz	55 Hz at Q_{hi} 140 Hz at Q_{lo} (at F_c)	18 7.3	2.6:1 total change due to both F and Q	2000 pF, 10% C_t; increase fixed tuning resistor from 33k to >47k to adjust tuning range
15	+SVF, variable Q	340-1260 Hz	40 Hz at Q_{hi} 75 Hz at Q_{lo} (in passband)	32 17	1.6:1 total change due to both F and Q at R4	Reduce fixed series Q resistor from 1.9 megohms to <1 megohm

Notes: *All filters except the single-pot B-Q used 3900-pF, 5% polystyrene capacitors. The single-pot B-Q model used 2000-pF, 10% polystyrene capacitors. **In any of the filters, raise or lower Q by raising or lowering R4, the Q-determining resistor.

Fig. 16. Test results and comments on the six sample filters.

NEW PRODUCTS

DANISH SWITCHES ARE MADE USER-FRIENDLY

MEC, a Danish company situated in Ballerup, a suburb of Copenhagen, Denmark, has been a switch manufacturer since 1938, until recently concentrating on rotary wafer switches. It now announces the multipurpose UNIMEC modular switch range.

Fig. 1 shows the basic alternate-action version of the PCB-mounting switch (the other option being a momentary-action version). The innovation is that each of the two switches contains all the contacts necessary to provide five alternative contact functions: two c/o contacts two make contacts, two break contacts, two make and two break contacts, and reversed polarity.

From the point of view of ordering and stocking, this gives the great advantage that only two types of switch need to be held in store. The required function is determined by simply selecting the appropriate switch terminal with the PCB tracking.

The UNIMEC is a low-profile switch (10 mm high) designed for 2.54-mm-grid PCB mounting. The housing and key are of glass-reinforced polycarbonate (Makrolon), the keycap system is ABS (Novodur), and the contacts, both fixed and moving, are 0.006-mm silver-plated brass, with gold plating available on request. Stainless steel is used for the moment spring, latch pin, and keyspring. The switch has a minimum lifetime of 1 million cycles. It can be positioned on the board straight or with a 180° twist. Contact resistance after 1 million cycles is typically 20 milliohms and contact bounce is less than 1 ms.

Figs. 2 and 3 show the assembly of the finished switch with knob and bezel. The design is intended to have tactile appeal, and the keys, knobs, and bezels are all available in a choice of ten colors. In addition to the color-coding possibilities, the UNIMEC can also be illuminated with up to four LEDs on any one switch. The LEDs are available in rectangular or pinhead format.

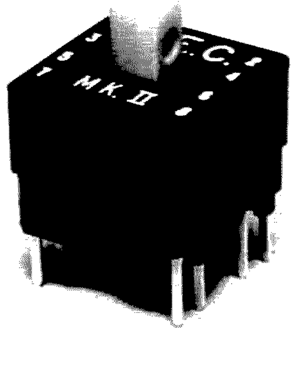


Fig. 1. UNIMEC modular switch.

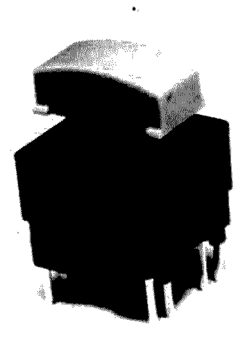


Fig. 2. UNIMEC switch with button.

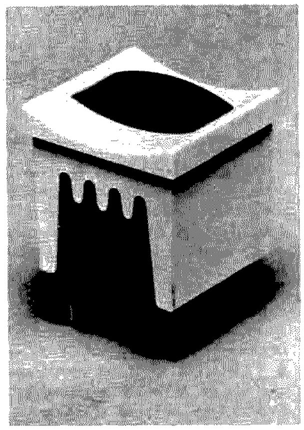


Fig. 3. UNIMEC switch with knob and bezel.

In order to make up individual switches into a keyboard, MEC produces the Vario-Support, a Makrolon matrix system available in any cell combination up to 10 × 10 (Fig. 4). The support it provides to the switch ensures accurate alignment and enables the switch to be mounted on a front panel. Pressure on the PCB is minimized, and PCB mounting is, in fact, no longer necessary.

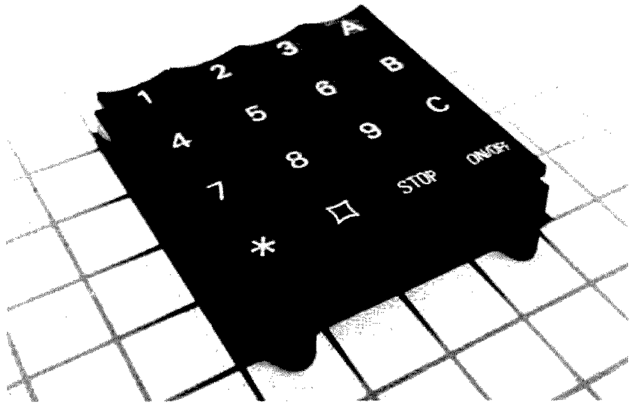


Fig. 4. The Vario matrix system for design-to-purpose panels.

The whole emphasis is on making things easy—the designing, ordering, and assembling—while the materials satisfy the engineer and the emphasis on a tactile design makes the finished product easy and pleasant to use.

To get the name of distributors in countries other than the US, contact MEC, PO Box 26, DK-2750 Ballerup, Denmark. The US distributor is *Electronic Components Group, 26 North Fifth Street, Minneapolis MN 55403; (612)-375-1606.* Reader Service number 480.

HAM HELP

I am looking for a schematic diagram and/or manual for the Electronics International Corporation model 150 VHF receiver.

John Vining
1514 A, 2nd Street, West
Cornwall, Ontario
K6J 1J3 Canada

I need a copy of the Kenwood phone patch PC-1A manual. Will pay for the reproduction gladly.

Albert S. Wilde W8JZZ
5580 E. Galbraith Road
Cincinnati OH 45236

Wanted: schematics for (1) RCA WO-33A scope, (2) Radio Shack catalog no. 40-217 stereo amp, (3) Olson RA-193 stereo receiver, and (4) Realistic 13-1180 stereo receiver. Advise cost.

J. L. Orysen
2025 Sunkist Ave.
Waukesha WI 53186

I need installation instructions for the Icom AH-1 automatic mobile antenna tuner.

Tom Phipps KA4CSG
PO Box 5404
Ft. Hood TX 76544

A friend of mine in Africa asked me if I could get for him a circuit diagram (schematic diagram) for a Hallicrafters HT-32 A and a National HRO model STA 1.

I will gladly pay postage and copying costs if anyone can supply these.

Rob Harrington
PO Box 3434
Littleton CO 80161

I need service literature and an operating manual for a Friden 2305A TTY Flexwriter. Name your price. Also, does anyone know the location of the manufacturer?

Bob Somers W2QYH
411 Hamilton Rd.
Glassboro NJ 08028

NEW HAMTRONICS CATALOG

Hamtronics, Inc., has announced publication of their new 1984 mail-order catalog for the VHF/UHF/OSCAR enthusiast and two-way radio shops. The 36-page two-color catalog features many new products, including an expanded line of FM repeaters and accessories such as power amplifiers, DTMF tone decoder/controllers, and autopatches. Also included are the lines of FM and AM receivers, FM transmitters, VHF and UHF transmitting and receiving converters, space-shuttle receivers, 800-MHz scanner converters, preamps, and other products Hamtronics has long been noted for.

For your free copy of this attractive new catalog, write to *Hamtronics, Inc., 65F Moul Rd., Hilton NY 14468, or call (716)-392-9430.* (For overseas mailing, please send $2.00 or 4 IRCs.) Reader Service number 479.

REGENCY'S 10-CHANNEL PROGRAMMABLE SCANNER

Regency Electronics, Inc., now offers a 10-channel programmable scanner with an arsenal of advanced features—including a little extra help during programming. Regency (the only American-made scanner brand) has announced the production of its Z10, covering six complete VHF and UHF frequency bands for access to thousands of police, fire, public service, business, commercial, and amateur-radio frequencies and channels. Selected frequencies from any band are easy to program into the scanner's memory; the Z10 can scan the frequencies in its memory or search the bands for whomever happens to be there.

The Z10 can scan its 10 channels in 2/3 of a second. Searching its three VHF bands, it can cover 1 MHz (200 frequencies in 5-kHz increments) in about 17 seconds; on its three UHF bands, it can search 1 MHz (80 channels in 12.5-kHz increments) in about 6 seconds. An automatic priority control checks any selected channel every two seconds and switches instantly if it's active.

Programming the Regency Z10 is made easier by a series of plain-language messages that appear on its display. These prompts identify the action that's in process or required next. Individual channels are programmed by using the numeric keypad to enter a desired frequency or by identifying a desired frequency when searching. A special circuit saves these entries in memory for up to a week (should power fail or if the unit is transported or temporarily stored); it does so without batteries (the usual method of memory protection) to avoid problems associated with battery failure from neglect.

The Z10 can pick up most transmissions in the low VHF (30–50 MHz), VHF two-meter amateur (144–148 MHz), standard UHF (450–470 MHz), and extended UHF (470–512 MHz) bands. Its telescoping antenna is

electronically optimized for each band, and an antenna jack is provided for an optional external antenna.

A channel lockout excludes selected channels from being scanned, a useful feature when interest is in monitoring some limited number of channels or when a selected channel becomes only occasionally of interest. Scanners in newsrooms, for example, often exclude fire-department tactical channels except during major fires.

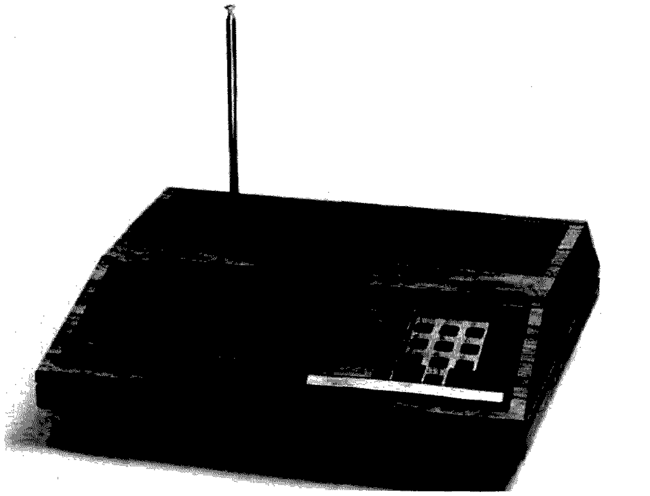
A scan-delay feature helps keep on top both sides of a conversation on channels where calls are usually met by replies. With scan delay selected, the Z10 waits for about two seconds at the end of a transmission (in case there's a reply) before it resumes scanning; without scan delay, scanning resumes in about six-tenths of a second.

When searching, the Z10 delays four seconds after a transmission before resuming its search. This not only allows time to listen for a reply, but also provides enough time to select the frequency for programming into one of the ten scanner channel memories—or simply to note the frequency on paper.

The human factors in the design of the Regency Z10 are quite apparent. Its easily-readable (vacuum fluorescent) display has big digits and a choice of two brightness levels. Sliding volume and squelch controls are easy to position accurately and easy to read with a glance. Its audio amplifier delivers a full 1 Watt at less than 10% distortion, and a jack for an external speaker is provided. The keyboard and display are angled for easy legibility.

Dual power supplies are built in to permit plug-in ac operation at home or dc operation in a car or other vehicle (where not prohibited by law).

The Regency Z10 is UL-listed and FCC-certified (Part 15, Subpart C). It measures 10-3/4 inches wide by 2-7/8 inches high by 8-3/8 inches deep.



The Regency Z10 scanner.

For additional information, contact *Regency Electronics, Inc., 7707 Records St., Indianapolis IN 46226-9986; (317)-545-4281.* Reader Service number 484.

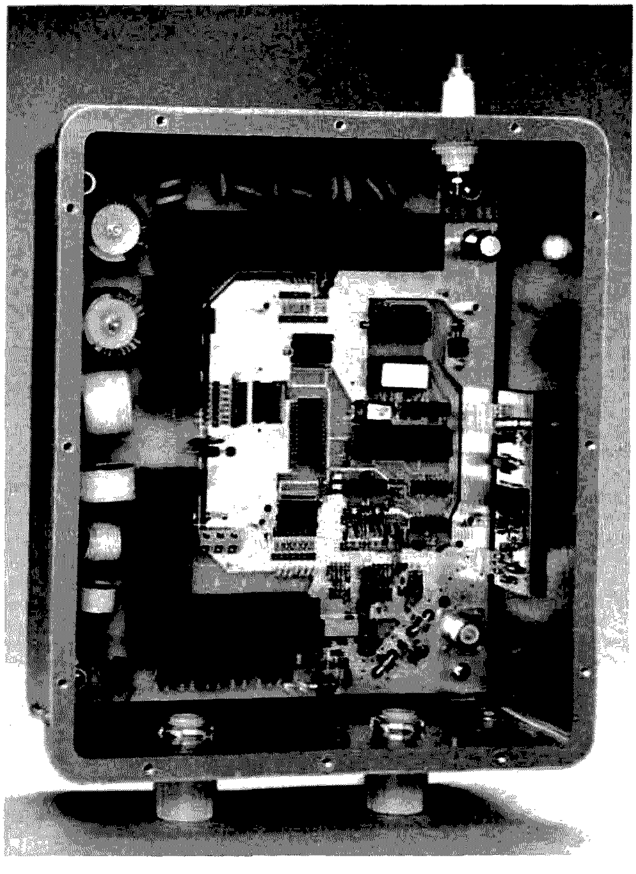
SEA'S AUTOMATIC ANTENNA COUPLER

Stephens Engineering Associates (SEA) has just introduced the SEA 1612 fully automatic antenna coupler. A state-of-the-art microprocessor-based coupler, the SEA 1612 features a "learning mode" that allows it to remember, store, and immediately access data for instant recall and matching the next time the same frequency is used. On-the-spot tuning is fast, accurate, and automatic.

The 1612 activates on the first syllable of a voice transmission and functions automatically to effect optimum transceiver-to-antenna power transfer over a full 1.6-to-25-MHz frequency range. The matching procedure is fully automatic and requires no action by the operator other than the normal press-to-talk function. The SEA 1612 does not require setup by a technician and has virtually no channeling limitations, providing an infinite number of channels within its specified frequency range.

The 1612 will operate with any HF/SSB transceiver that has standard 50-Ohm output. Connections between a transceiver and the coupler consist only of 50-Ohm coax and a 13.6-volt-dc cable. An "Antenna Tuned" flag line is also available to signal the operator that the antenna system has tuned. A single 23- to 75-foot antenna is all that is required.

The coupler is self-contained within a sturdy housing of molded fiberglass with a gasket-sealed weatherproof cover. For complete details and technical specifications, please contact *Stephens Engineering Associates, Inc., 7030 220th SW, Mountlake Terrace WA 98043; (206)-771-2182.* Reader Service number 478.



The SEA automatic antenna coupler.

SOLDERING SYSTEM HAS OVER 270 OPTIONS

With Wahl Clipper Corporation's new assortment of 15 miniature soldering irons and 23 tips, a user can choose from over 270 different soldering combinations to match precise soldering needs.

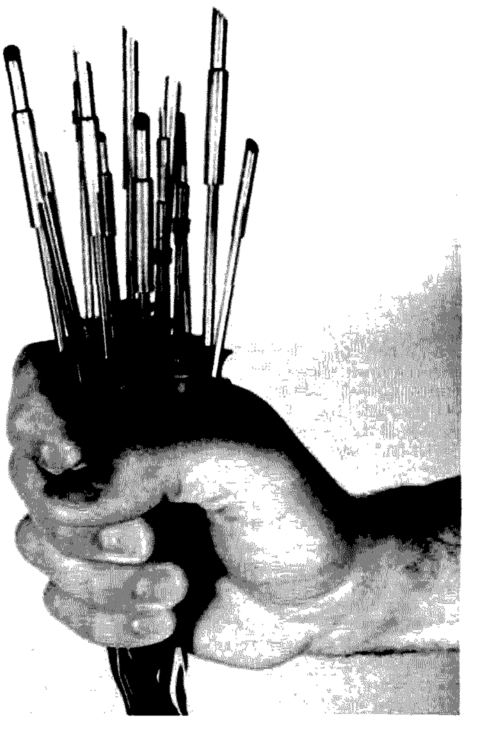
The 15 Oryx® miniature irons, each weighing ½ an ounce or less, are available for temperatures ranging from 575° to 850° F, from 5 to 25 Watts, and from 4.5 to 24 volts. Their compact size and precise temperature control make them useful for soldering heat-sensitive components.

The irons can be combined with any of 23 tips ranging in size from 1/25" to 3/32" in several choices of configuration. Tip construction is nickel-plated or iron-plated copper for most applications, with solid nickel, gold-end, and bare copper alloy (NASA) tips available for special requirements. Tip changes are easy and no tools are required. Cooled tips simply slide off and on.

For further information, contact *Wahl Clipper Corporation, Sterling IL 61081; (815)-625-6525.* Reader Service number 483.

FLESHER CORPORATION'S NEW TU-1200

The new TU-1200 UHF/VHF RTTY terminal unit from Flesher Corporation is in answer to rapidly-growing high-speed com-



The Oryx miniature soldering system.

Flesher Corporation's TU-1200.

munication needs. The TU-1200 receives all Baudot and ASCII rates to 1200 baud and uses Bell 202 standard tones (1200 Hz and 2200 Hz). The TU-1200 has many applications for modern communications, including RTTY repeater systems. The TU-1200 provides TLL- and RS-232C-compatible I/O and includes transmitter PTT output for complete remote control. It also provides AFSK output and RDA (received data available).

Front-panel controls include only three push-button switches to operate: POWER, SEND, and NORMAL/REVERSE SHIFT. Three LED indicators show their status. The TU-1200 is constructed with a all-metal case for protection. It's 5-1/8" W × 1-3/4" H × 6" L, and rear-panel DB-25 I/O connectors make installing and using the TU-1200 simple.

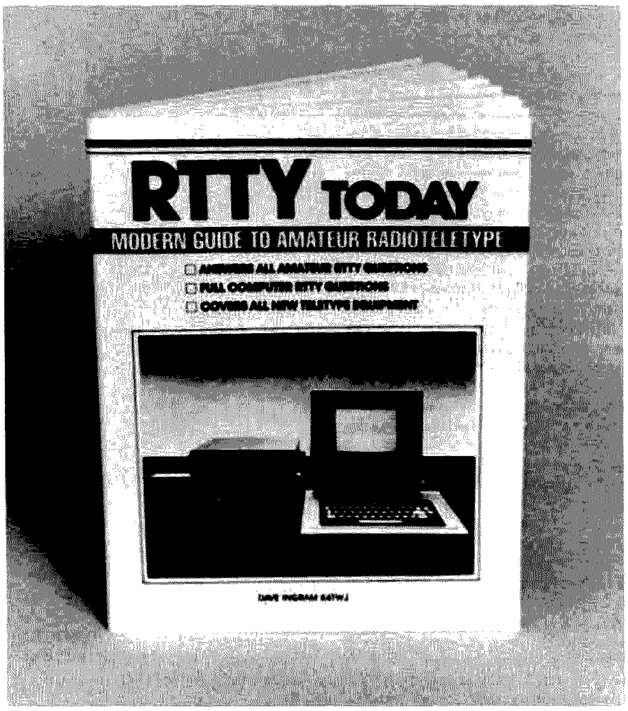
Available either wired or in kit form, the TU-1200 comes complete with a mating DB-25 I/O plug, power supply, and an operator/assembly manual. The TU-1200 will be available for delivery by April 30, 1984.

For more information and for a catalog, write the *Flesher Corporation, PO Box 976, Topeka KS 66601 or call 1-800-HAM-RTTY.* Reader Service number 482.

RTTY TODAY

RTTY Today is a completely new guide to amateur RTTY which covers all phases of radioteletype. This new book answers many questions asked about amateur RTTY and other areas such as the home computer for RTTY use.

Authored by Dave Ingram K4TWJ, a noted authority on all phases of RTTY, it's written in a clear, concise manner; all material is new and up-to-date and covers the most recently developed RTTY equipment and systems. *RTTY Today* is fully illustrated with photos, diagrams, RTTY-station setups, and equipment.



K4TWJ's new guide.

In a large 8½" × 11" softbound edition with an easy-to-read type style and format, the book's eleven chapters cover: The Exciting World of Amateur RTTY, Operating Parameters and Concepts of RTTY, Straight Talk on Home Computers and RTTY, RTTY Systems for Home Computers, RTTY Converts You Can Build, Dedicated RTTY Terminals and Systems, New Mini-RTTY Systems, Fascinating RTTY Outside the Amateur Bands (Press, Military, Weather, Etc.), Frequency list of Commercial Press Services, Secrecy and Other Codes Used in Radioteletype Work, and Tables of Abbreviations Used in RTTY.

For further infomation, or to order, write or call *Universal Electronics, Inc., 4555 Groves Road, Suite 3, Columbus OH 43227; (614)-866-4605.* Reader Service number 481.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

Last month I wrote a bit about a new toy here at WA3AJR, a TRS-80C Color Computer. Based on the most powerful eight-bit microprocessor around, the Motorola 6809, this is a fascinating computer which gives huge potential at a bargain price.

Well, I have had a chance to take a quick look at one piece of RTTY software available for the CoCo—a RTTY/CW program from Clay Abrams Software. Clay is known to us 68xx mavens from way back and has been one of a kernel of boosters for 68xx systems for many years. This looks like one fine piece of software, folks. I will have a full review next month, but for those of you who just can't wait, let me dangle a few choice tidbits. This program will receive and transmit RTTY at all common speeds, either in Murray or ASCII, and receive and transmit Morse at up to 99 words per minute. It has buffers for transmit, tape save, and more. Not all is golden, Clay, but I am impressed! More about this gem next month.

Not to stay stuck in one CPU vein, I have a card here from Henry Kirchmer KF4UW in Rockledge, Florida. Henry asks, "Do you know if anyone makes an interface for RTTY and CW and the software for the Timex/Sinclair 1000 or new 1500 that I could use with my (transceiver)?" Well, by a stroke of serendipity, also in the mail arrived an issue of *QZX*, billing itself as "The Journal Covering Amateur Radio and Sinclair Computers—ZX-80, Micro Ace, ZX-81, and Timex/Sinclair 1000/1500." In the issue I received (November, 1983), articles include several for interfacing the Timex/Sinclair-type machines on RTTY and CW, with explanations of ASCII and Murray (although they call it Baudot) code for the computerist ham. They even have a short bibliography in the back with articles in various amateur-radio magazines related to RTTY. I am a bit disturbed, however, that while they have a listing for *73: Amateur Radio's Technical Journal*, they do not mention this column. Oh well, I quess somebody at *QZX* reads this column—after all, I did get a copy. Anyway, interested prospective readers might drop them a line at *QZX*, 2025 O'Donnell Drive, Las Cruces, New Mexico 88001. A year's subscription is $12, according to the information received. It wouldn't hurt if you mentioned that you read about them in "RTTY Loop," would it?

Another source of RTTY for the Timex/Sinclair is Ken Carpenter KC4UG who makes a series of programs under the business name of Kentronics. That is not to be confused with Kantronics, mind you! Well, Ken offers a series of programs, including RTTY transceive programs, Morse programs, and some amateur-radio utilities, all designed for the Timex/Sinclair 1000 or Sinclair ZX-81. His RTTY program, for example, is touted as featuring receive and transmit buffers, split-screen display, multiple baud rates for either Murray or ASCII modes, hardcopy option, and more. Requirements include a computer with 16K or more of RAM, a RTTY I/O port, and a terminal unit capable of interfacing with TTL-level (not RS-232) signals.

That I/O port is designed around an 8250 ACIA which takes care of providing a baud clock along with converting serial to parallel and back again. Apparently, there are also transistors provided for some degree of isolation from outside voltages. No mention is made of optoisolators or the like.

Typical prices for these items are $25 for a tape of the RTTY program, guaranteed to load or it will be replaced upon return, and $70 for an assembled and tested interface unit, plus postage and handling. I have no information on how well or easily this RTTY interface operates; maybe some of you who have played with it will let me know. However, it does seem as though more is becoming available for this truly low-cost computer.

If you would like more details, write to Ken at his office, Kentronics, Inc., PO Box 586, Vernon, Alabama 35592. Be sure to watch the spelling of their name, and drop ours, OK?

While I cannot speak from the experience of having used the following program myself, a letter from Jerry Welkrauch KØHZI in North Riverside, Illinois, speaks very highly of a RTTY program for the VIC-20 and Commodore-64 computers. Available from RAK Electronics, these packages feature software to turn either computer into a basic RTTY terminal and sell for under twenty dollars each. Sounds like quite a bargain! You have to provide a terminal unit or some other way to turn the receiver audio into on/off pulses and an AFSK oscillator to generate the necessary tones. If you're interested, drop RAK a line at PO Box 1585, Orange Park, Florida 32067-1585. I don't need to prompt you as to where to tell them you read about them, but let me know what you think if you try the software.

Going from systems that seem to have a lot written for them to the other extreme, I have a letter here from Philip Shulins WD4OSS in Daytona Beach, Florida. Phil notes that he is "drooling with anticipation" looking for a RTTY program for his Kaypro-2 computer. Well, Phil, as I have indicated here before, there have been relatively few programs, or even program announcements, that have crossed my desk for the IBM-type computers. If you can run a standard CP/M-type program, you may be able to find one on a local RBBS, but otherwise, I am afraid I draw a blank. I will keep my eyes out, though, and pass along any information I receive here to you and the rest of the gang.

I have a letter here from Hughie Chavis (I can't find the envelope, so I am not exactly

sure where he is). Anyway, Hughie is trying to run a Teletype® KSR-35 from his TI-99/4A computer by running data out of an RS-232 module. He writes, "The KSR-35 is set for 100-wpm serial data transfer. The lowest baud rate for the TI RS-232 module is 110 baud. The TI RS-232 module has a PIA port in addition to the serial I/O port. My question is, how do I connect the KSR-35 to the RS-232 module so the printer capability can be utilized?"

Well, there is a very basic problem with connecting these two units together; they are not speaking the same language. Forget dialects, I'm talking major languages—ASCII and Murray are about as different as English and Hebrew. It would not be too hard to connect the parallel port of the TI interface module to a simple UART chip (such as the common 1013 variety), provide a clock circuit, and put the data out at the correct rate, but the problem remains that the data coming out of the computer is in the wrong code.

Let me explain. To begin with, realize that the "baud" designation merely refers to how many data bits per second are being transmitted. There is no relation between the "baud rate" and the type of encoding used to send the data. With plain old Murray code—the one we are all familiar with on RTTY, and the one which your KSR-35 speaks—one common speed is the so-called 60 words per minute. Now, not to go into all the math right now, each character consists of five data bits, one start bit, and a stop bit which is a tad longer than the others. This works out to 7.41 units per character, with each unit being one bit of 21 ms length. Each character thus takes 7.41 times 0.021 seconds, or 0.163 seconds. In one minute, there would be 368 characters; in one second, 6.134 characters. Now, 6.134 characters per second times 7.41 bits per character (remember how the units canceled out in algebra?) yields 45.45 bits per second. This is 45.45 baud.

Without working through all this math again, trust me that the commonly called "100-wpm" speed is about 75 baud. That's one problem, and we're still talking five-level Murray code.

The TI computer, as most others, uses seven-bit ASCII to communicate with the outside world. Now each character consists of a start bit, seven data bits, a parity bit, and either one or two stop bits, depending often on the hardware involved. These bits do not in any way, shape, or form correspond to the RTTY Murray code. What you will have to do is convert the ASCII coming out of the computer to Murray, shift speeds, then put it in a form that the KSR-35 can accept.

I'll let you think on that one for a bit, and next month I'll show you a few ways to accomplish this task. While software techniques have been the most popular with users of some computers, the limited access to the TI-99/4A's innards might well hamper that approach, and I feel that you might be inclined to stick with a totally outboard approach. Let me get out the drafting board and see what develops.

Now, a note to all of you who have tried to call me on the phone over the last few months. Please don't. It's not that I dislike your calls, but I am a physician and my home number is not listed. It will stay that way for professional reasons. My office number, or answering service, has fielded a number of RTTY calls in past months, and they don't always know what to do with them. So, if you have a question or would like to offer some words to the column, jot them down on a card or letter and mail them to me at the above address. If you would like a reply, enclose a self-addressed, stamped envelope, and I shall try to answer you as soon as possible. I try to scribble something down, usually at the bottom of your letter, and return it to you within a few days, unless I need to hold it for information, publication, or the like. I love hearing from you all, pro and con, and it is often your input, suggestions, and questions which make many readers write that the first thing they look for when they get their copy of *73* is "RTTY Loop."

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

HOLIDAY-IN-DIXIE QSO PARTY
1800 GMT to 2300 GMT April 7

The seventh annual Holiday-In-Dixie QSO Party will be sponsored again this year by Shreveport, Louisiana, ham-radio operators. Operators will be working on 40 meters, 20 meters, and 15 meters. If 10 meters is open, we will try it from 1800Z to 1900Z.

Holiday-In-Dixie is an annual ten-day celebration of the Louisiana Purchase.

EXCHANGE:

RS(T) and QTH.

FREQUENCIES:

CW—60 kHz up from low edge of 40-, 20-, and 15-meter bands.

SSB—7240, 14280, 21370, and 28570.

Novice—7125 and 21125.

AWARDS:

Send an SASE with QSL card to Holiday-In-Dixie QSO Party, PO Box 4842, Shreveport LA 71104. 8½"×11" certificates will be mailed upon receipt of the SASE and QSL card.

QRP ARCI APRIL QSO PARTY
Starts: 1200 GMT April 21
Ends: 2400 GMT April 22

Stations may be worked once per band for QSO multiplier credits. Participants may operate a maximum of 24 hours during the contest period.

EXCHANGE:

Members—RS(T), state-province-country, and QRP ARCI membership number. Nonmembers—RS(T), state-province country, and power output.

SCORING:

Each member QSO counts 5 points regardless of location. Nonmember QSOs are 2 points with US and Canadian stations, others 4 points each. Multipliers are as follows: 4-5 Watts output—×2, 3-4 Watts output—×4, 2-3 Watts output—×6, 1-2 Watts output—×8, and less than 1 Watt output—×10. Entries from stations running more than 5 Watts output will count as check logs only. Stations are eligible for the following bonus multipliers: if 100% natural power (solar, wind, etc.) with no storage—×2, if 100% battery power—×1.5.

Final score is total QSO points times total number of states-provinces-countries per band times the power multiplier times the bonus multiplier (if any).

FREQUENCIES:

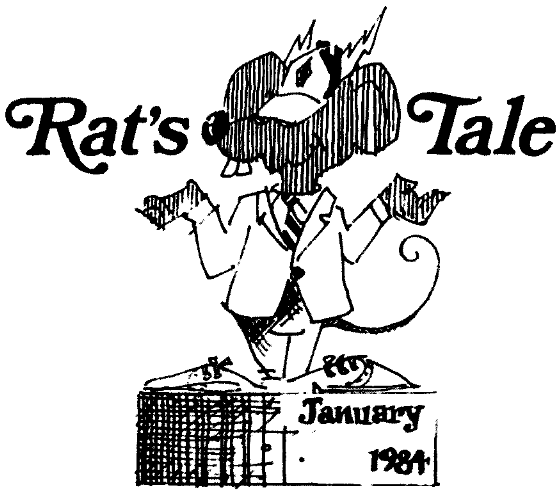
1810, 3560, 7040, 14060, 28060, 50360. Novice/Tech—3710, 7110, 21110, 28110. No 30-meter contacts will be counted!

AWARDS:

Certificates to the highest-scoring station in each state, province, or country with 2 or more entries. Entries automatically considered for annual Triple Crowns of QRP Award. A special MILLIWATT certificate is being sponsored by W9RSP for

CALENDAR

Apr 7	Holiday-In-Dixie QSO Party
Apr 21-22	QRP Amateur Radio Club April QSO Party
Apr 28-29	Massachusetts QSO Party
Apr 28-29	County Hunters SSB Contest
Apr 28-29	Helvetia Contest
May 5-6	Late Spring QRP SSB Activity Weekend
May 5-8	Florida QSO Party
May 19-21	Michigan QSO Party
Jun 9-10	ARRL VHF QSO Party
Jun 23-24	ARRL Field Day
Jul 13-15	A5 International SSTV-DX Contest
Aug 4-5	ARRL UHF Contest
Aug 11-12	New Jersey QSO Party
Aug 24-27	A5 North American UHF FSTV-DX Contest
Sep 8-9	ARRL VHF QSO Party
Sep 15-17	Washington State QSO Party
Sep 22-23	Late Summer QRP CW Activity Weekend
Oct 6-7	ARRL QSO Party—CW
Oct 13-14	ARRL QSO Party—Phone
Nov 3-4	ARRL Sweepstakes—CW
Nov 17-18	ARRL Sweepstakes—Phone
Dec 1-2	ARRL 160-Meter Contest
Dec 8-8	ARRL 10-Meter Contest
Dec 28-Jan 1	QRP Winter Sports—CW



NEWSLETTER OF THE MONTH

Dateline Nashville: Source of muffled guffaws emanating from city sewers confirmed. RATS! Don't panic, Music City, it's only members of the Radio Amateur Transmitting Society of Nashville enjoying the latest issue of *Rat's Tale*.

This publication is a pleasure to read. Surrounding the obligatory meeting announcements are the exploits of Chairman Mac, Boy George, and the ubiquitous Dr. Jack Byrd. Animals tiptoe across the pages. Seedy rodents in three-piece suits adorn the masthead.

Despite the lighthearted mood of *Rat's Tale*, editor Wayne Renardson NZ4W has skillfully tempered the hilarity with genuine news stories, thought-provoking commentary, and scathing letters from the membership. Close attention to mechanical detail rounds out a package any RAT would be proud of.

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

the highest-scoring station in the less-than-1-Watt category, provided there are two or more entries in that power category.

LOGS AND ENTRIES:

Separate log sheets are suggested for each band for ease of scoring. Send full log data, including full name, address, and bands used. Also send a work sheet showing details and time(s) off air. Make sure your callsign is written on the top margin of every page submitted! No log copies will be returned. All entries desiring results and scores please enclose a business-size envelope with return postage for one ounce or an IRC. It is a condition of entry that the decision of the QRP ARCI Contest Chairman is final in case of dispute. Logs must be received by May 21 to qualify. Send all logs and data to: QRP ARCI Contest Chairman, Eugene C. Smith, Jr. KA5NLY, #16 Fairmont Drive, Little Rock AR 72204.

MASSACHUSETTS QSO PARTY
Starts: 1600 GMT April 28
Ends: 2400 GMT April 29

Sponsored by the Pilgrim Amateur Wireless Association. A station may be worked once per band. Phone and CW are considered separate bands. No cross-band or repeater contacts are permitted. Mobiles and portables may be contacted each time a county change takes place.

EXCHANGE:

RS(T) and state, VE province, or Massachusetts county. Massachusetts stations also will indicate if member of PAWA.

SCORING:

All stations count 2 points for each completed SSB exchange and 4 points for each completed CW exchange. Massachusetts stations then take the total QSO points and multiply by the total number of Massachusetts counties, states, provinces, and PAWA members worked to compute the final score. Others, multiply the total QSO points by the total number of Massachusetts counties and PAWA members worked. Multiplier credit for PAWA club members worked may be counted only once.

FREQUENCIES:

Phone—1820, 3960, 7260, 14290, 21390, 28590, and 50110.

CW—1810, 3560, 7060, 7120, 14060, 21060, 21120, 28060, and 28120. Use of FM simplex is encouraged. Please use CW on CW bands only!

AWARDS:

Certificates will be awarded to 1st-, 2nd-, and 3rd-place winners in each Massachusetts county, state, and VE province, plus the high-scoring Novice in each state. A plaque will be given to the Massachusetts station submitting the highest number of QSOs bettering the record of 1483 QSOs now held by K1GSK in the 1979 Massachusetts QSO Party.

ENTRIES:

Logs must show date, time, band, mode, callsign, state and province worked, and exchange RS(T). Submit a separate summary sheet along with the logs. Summary sheet should include: name, call, mailing address, Massachusetts county, total QSO points, multipliers claimed, and total score. All entries with more than 100 QSOs please send a dupe sheet. Deadline for mailing is May 31. For awards and results include $0.40 postage (no envelope). Address entries to: Ed Peters K1KJT, 29 Greenbrier Drive, New Bedford MA 02745.

COUNTY HUNTERS SSB CONTEST
0001 to 0800 GMT April 28
1200 GMT April 28 to 0800 GMT April 29
1200 to 2400 GMT April 29

Please note the two 4-hour rest periods. Mobiles may be worked each time they change counties or bands. Mobiles that are worked again from the same county on a different band count for point credit only. Mobiles that are contacted on a county line count as one contact but 2 multipliers. Mobile teams count as two contacts if both participate in the exchange. Fixed stations may be worked by other fixed stations only once during the contest. Repeat QSOs between fixed stations on other bands are not permitted. Fixed stations may be worked by mobiles each time they change counties or bands. Repeat contacts between mobiles are permitted provided they are on a different band or county. Mixed-mode contacts are permitted provided that one station is on SSB. Contacts made on net frequencies will not be allowed for scoring in this year's contest.

EXCHANGE:

Signal report, county, and state or country.

FREQUENCIES:

Suggested frequencies are as follows: 3920-3940, 7220-7240, 14275-14295, 21375-21395, 28625-28850. There will be a "mobile window" of 10 kHz on the following frequencies: 3925-3935, 7225-7235, 14280-14290. Mobiles will be in this 10-kHz segment and fixed stations are asked to refrain from calling "CQ contest" in the mobile window. After working mobiles in the window, fixed stations are requested to QSY outside the window to work fixed stations in the contest. This will allow the mobiles running lower power a chance to be heard and worked in the contest.

SCORING:

Contact with a fixed US or Canadian station—1 point. Contact with a DX station (KL7 and KH6 count as DX)—5 points. Contact with a mobile station—15 points. Contact with a mobile team station—30 points. The multiplier is the total number of US counties plus Canadian stations worked. The final score is this multiplier times the total QSO points.

AWARDS:

MARAC plaques to the highest-scoring fixed US or Canadian station, DX station, mobile team, and top 2 mobile stations. Certificates to the top 10 fixed, mobile team, and mobile stations in the US and Canada, and to the highest-scoring station in each DX country.

ENTRIES:

Logs must show date and time, station worked, reports exchanged, county, state, band, claimed QSO points (1, 5, 15, or 30), and each new multiplier must be numbered. Logs and summary sheets are free for a #10 SASE or SAE and appropriate IRCs. Write to: John Ferguson WØOWS, 3820 Stonewall Ct., Independence MO 64055. All entries must be received by June 15 to be eligible for awards. DX entries should use air mail. Winners will be announced at the 1984 Independent County Hunters Convention during July, and in the *MARAC Newsletter.*

HELVETIA CONTEST
Starts: 1300 GMT April 28
Ends: 1300 GMT April 29

Use all bands, 1.8 to 28 MHz, on CW or phone. Each station can be worked once per band regardless of mode.

EXCHANGE:

RS(T) plus three-figure serial number starting at 001. Swiss stations will also give their 2-letter canton.

SCORING:

Each contact with an HB station counts 3 points. The multiplier is the sum of Swiss cantons worked on each band, 26 maximum per band. Final score is the sum of QSO points multiplied by the sum of cantons worked on each band.

ENTRIES AND AWARDS:

Certificates will be given to the highest scorer in each country. USA and Canadian call area are considered as separate countries. Entries with more than 1 log sheet must have QSOs separated per band. A multiplier checklist is appreciated. Use a summary sheet as usual and indicate call, name, address, single or multi-operator, number of QSOs, points and multipliers per band, plus total final score. Also include station description, power output, and declaration that rules of the contest and license regulations have been observed. Logs must be postmarked not later than 30 days after the contest and sent to: Gody Stalder HB9ZY, Tellenholf, CH-6045 Meggen, Switzerland. Canton abbreviations are: ZH, BE, LU, UR, SZ, OW, NW, GL, ZG, FR, SO, BS, BL, SH, AR, AI, SG, GR, AG, TG, TI, VD, VS, NE, GE, JU.

H26 AWARD:

This award is for contacts made after January 1, 1979. Send a list and QSL for each of the 26 cantons worked to: Kurt Bindschedler HB9MX, Strahleggweg 28, CH-8400 Winterthur, Switzerland.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

THE WONDROUS WWV

What one station do hams listen to more than any other? WWV probably has the lock on that statistic. WWV has been providing time and frequency information to amateurs and others for more than 60 years. Let's have a close look at the station and how WWV can improve your DXing.

First, you have to hear the station. Almost every modern amateur rig has a separate position on the bandswitch to receive WWV, usually on 10 MHz. Simply connect an antenna, switch to the WWV position, and tune to the appropriate frequency. Note that WWV transmits in AM, so use the AM position on your receiver or turn off the bfo.

The first thing you will hear is a steady 500- or 600-Hz tone, interrupted every second by a "tick" or pulse. At the end of each minute, the tone stops and a voice gives the time in Coordinated Universal Time (UTC). The next minute begins with a longer tone of 1000 Hz. The *start* of this longer tone is the exact *start* of the minute just identified by the voice announcement. In other words, you hear "At the tone 17 hours, 19 minutes Coordinated Universal Time. . . . Beep." The time is exactly 1719 UTC at the start of the beep.

Probably the first thing a DXer will do when listening to WWV is to reset his or her watch and radio-shack clock. Every DXer should have at least one reasonably accurate clock set to UTC. Since you can purchase a digital watch or small, stick-on clock for less than five dollars, there is really no excuse not to have a timepiece dedicated to UTC. And do you know how you can tell a true DXer? His wristwatch is set to UTC!

How often should you reset your clock or watch? That depends on how well it keeps time. My ancient Tymeter clock (the one with the numbers on plastic cylinders which provided a "digital" readout years before liquid-crystal displays) keeps such good time that I only reset it every month or so. You can note the time you reset the clock in your log so that you can look back to see how much time your timepiece has gained or lost. If your clock is off by more than one minute a day, reset it every day.

An error of only a few minutes in your log can make the difference between confirming the contact and not. A DX station might be making as many as 6 contacts a minute. If your time on your QSL card is off by only 3 minutes, your callsign might be 20-30 calls away from your claimed time. The DX station or QSL manager may have to search an entire log sheet for your call. By having your time accurate to the minute, you can reduce the chances that the DX station will not find your call.

You can also check the time on your shack clock *after* an important contact. Simply tune immediately to WWV and note the time difference between WWV time and your clock. Then change the time in your log to match the correct time. You can trust WWV to broadcast the correct time.

The Atomic Clock

Let's have a look behind the signal and see why you can trust the accuracy of WWV. The time broadcast on WWV derives from *the* clock a few miles south, in Boulder, Colorado. There, nestled against the Rockies, only a few miles from the Continental Divide, sits NBS-6 (see Photo A). NBS-6 is the latest in a line of cesium-beam clocks produced by the National Bureau of Standards. These cesium-beam clocks use an automatic feedback system to produce a microwave signal of exactly 9,192,831,770 Hz. This frequency is a resonant frequency of the cesium atom, upon which the atomic clock is based.

During the 30 years that the National Bureau of Standards has been working on atomic clocks in Boulder, they have produced the most accurate and stable timepiece in the world. In fact, scientists recently redefined the international unit of length, the meter, on the basis of the ac-

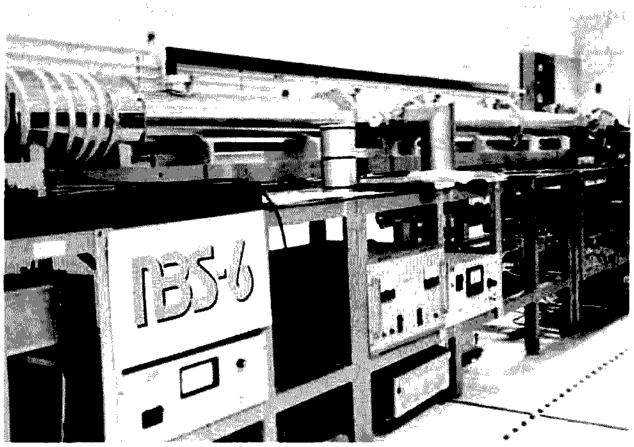


Photo A. NBS-6, the cesium-beam atomic clock at the National Bureau of Standards in Boulder, Colorado. This clock is the most accurate timepiece in the world!

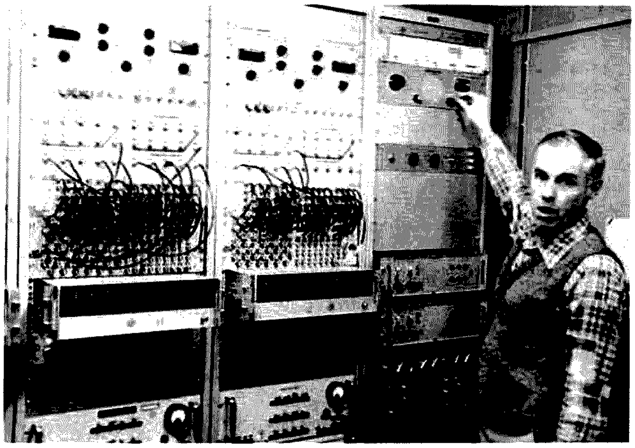


Photo C. Engineer Howard Machlan with two of the three identical cesium-beam clocks which keep the time at the WWV transmitter site in Fort Collins.

curacy of the cesium-beam clock. NBS-6 is accurate to better than one part in 10 trillion. That's about one second in 3 million years!

NBS-6 is so accurate that the time it determines is more accurate than the Earth's rotation. Since all our clocks are based on the cesium-beam atomic clock in Boulder, it would be possible for this time to be "out of synch" with the real world. Midnight would move slowly toward evening. A far more practical problem would be that sailors navigating by the stars would find themselves in the wrong place! Scientists got around this problem by agreeing to add "leap seconds" to UTC as often as needed to keep atomic time in step with sunrises and sunsets. About once a year they add an extra second to the day at midnight, to keep everyone on the same time scale.

But all this is down in Boulder, about 30 miles from the site of WWV, outside Fort Collins, Colorado. What's the connection between the atomic clock in Boulder and the WWV transmitters? Surprisingly, there is *no* direct connection. The time transmitted by WWV is generated right there at the WWV site, by smaller cesium-beam clocks. WWV uses three of these Hewlett-Packard commercial-model cesium clocks (at about $25,000 each).

Why three clocks? The argument is as follows: If you have only one clock, it might break down, putting you off the air, or it might be wrong. There would be no way to check its accuracy. On the other hand, if you had two clocks, and they showed different times, you wouldn't be able to tell which one was correct. Only with three clocks can you tell if one is incorrect. If one of the three clocks malfunctions, an operator must repair it as quickly as possible, to avoid the two-clock problem.

Of course, these atomic clocks keep pretty good time all by themselves. I watched a strip-chart recorder measure the time variation in the WWVB clocks, and with a full scale of only one microsecond, the pen didn't even wiggle down the center of the chart! Even so, the time they generate is regularly compared to that produced by the master atomic clock down in Boulder.

At one time they physically moved a portable atomic clock from one town to the next to make this comparison, but the WWV Chief Engineer, John Milton ex-WØDAV, came up with a better way using Denver TV stations. He compares the time a certain reference point on the TV signal arrives at Boulder and at the WWV site further north. He knows how much further Fort Collins is from Denver than Boulder and can determine the extra time the reference point should take to reach his receiver. A custom computer program handles the actual comparison and recalibrates the WWV atomic clocks daily.

Even without this daily check, John Milton feels confident enough of his equipment that he could maintain the high accuracy of the WWV information. "We know the drift rates of each clock so well that we can keep going for months without any reference standard," John says. This drift isn't much: about one-tenth of a microsecond in four hours!

Getting the Word Out

Of course, all the accuracy in the world would be worthless if you had to go to Fort Collins to check your watch. Thanks to WWV, however, you don't have to travel to Colorado for this information.

All the WWV signals, tones, and even the basic carrier frequencies are derived from the same cesium-beam clocks which keep track of the time. The extremely stable signal from the clock is divided and mixed to produce each different signal, tick, tone, and beep. Only the voice announcements don't come out of the clock. This means that just about everything you hear on WWV (carrier frequency, tone frequencies, etc.) has the same high degree of accuracy. That mass of cables above the digital readout (see Photo C) is a patch panel for all the frequency dividers and other circuits which produce the pattern of tones and ticks on the WWV signal.

Photo B. John Milton, chief engineer at WWV, keeps the time-and-frequency-standard station on the air, on time, and under budget.

The only parts of the WWV signal which are *not* produced by the cesium clocks are the voice announcements of time and other factors. These voices are recorded on high-quality drums and added to the WWV signal at the appropriate time. No, there isn't anyone sitting there reading the time all 24 hours.

All the WWV signals, on 2.5, 5, 10, 15, and 20 MHz, are amplitude modulated (AM). After the basic signal is generated by the clock, complete with tones, etc., it leaves the heavily-shielded clock room and goes to the series of 8 amplifiers arranged in the circle around the building. These transmitters are linear amplifiers which take the low-level signal from the clock room and amplify it to about 10,000 Watts output! (The 2.5- and 20-MHz amps run a mere 2,500 Watts.) For good reliability, these amplifiers are 40,000-Watt units, run at low power.

Reliability is a key factor at WWV. The total "down time" is less than 0.002%! Engineer John Milton has developed a complete package of procedures and equipment to ensure this fantastic reliability. First, each of the three cesium clocks has a backup battery system, should commercial power fail. A huge diesel generator sits in the back of the WWV building, ready to kick in at a moment's notice and power all the transmitters. And each transmitter has an automatic reset feature. If the transmitter fails for whatever reason, the built-in system will restart the transmitter. If it fails again, one of the standby transmitters takes over.

There is a "dedicated" standby transmitter for the 5-, 10-, and 15-MHz signals, all wired and tuned, set for automatic replacement. WWV monitors the actual transmitted rf, listening for any change in signal strength.

The signals leave the WWV building through gas-filled coaxial lines to one-half-wavelength, vertical antennas. These are simply dipoles stood on end. This gives a good omnidirectional pattern. There are even spare antennas: Two all-band verticals stand ready to take over if one of the primary antennas is damaged.

WWV has achieved this excellent on-line record in spite of major cutbacks in funding. The station had as many as 20 people at one time, monitoring the equipment around the clock. Now, thanks to automated backups, the staff consists of exactly three engineers and a single secretary, all working standard hours. The rest of the time the entire station is deserted, except for dozens of fuzzy brown rabbits

and an occasional deer. The entire annual budget for the station, including the low-frequency WWVB, is about $200,000, and that includes an electricity bill of about $6,000 per month!

One casualty of the budget crunch has been the 25-MHz signal, which was discontinued in 1977. It wasn't taken off the air because it cost too much to operate; the transmitter was needed as a dedicated standby for the other frequencies. Still, WWV is *one* government organization which provides an excellent service for a remarkably small amount of money.

(Next month we'll look at some of the *other* (non-time) reasons to listen to WWV. Meanwhile, tune in to 10.00000000 MHz at 18 minutes after the hour.) Don't worry; we'll show how this WWV information is vital to successful DXing in future columns.

DEVIL'S MOUNTAIN

Churum-Vena Expedition. In one of the more unique DXpeditions of 1984, a group of Venezuelan amateurs will operate from Devil's Mountain, deep in the heart of Venezuela. Churum Vena is better known as Angel Falls. At 3213 feet, it is the highest waterfall in the world. The waterfall (named after its discoverer, James Angel) plunges down the side of seldom-climbed Devil's Mountain. The normal viewing point for the falls is at the bottom of the canyon below, but at the end of March and early April, 4M5ARV/6 will be on all bands from the top. Frequencies are: CW—3710, 7010, 14010, 21110, and 28110 (Novices take note!); SSB—3795, 7095, 14195, 21295, and 28595. QSL via PO Box 3636, Caracas 1010-A, Venezuela.

And who is that you hear on 15-meter SSB? VP2ML? Montserrat might not be the rarest of DX, but *I* look forward to working you the last week in March and the first week in April. QSL via K1RH. 73, and see you on the bands!

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

FRAMINGHAM MA
APR 1

The Framingham ARA, Inc., will hold its annual spring flea market on Sunday, April 1, 1984, beginning at 10:00 am at the Framingham Civic League Building, 214 Concord Street (Rte. 126), downtown Framingham. Admission is $2.00 and tables are $10.00 (pre-registration required). Sellers may begin setups at 8:30 am. There will be radio equipment, computer gear, and food in-house. Talk-in on 147.75/.15 and .52. For more information, contact Jon Weiner K1VVC, 52 Overlook Drive, Framingham MA 01701, or phone (617)-877-7166.

TRENTON NJ
APR 1

The Delaware Valley Radio Association will hold its 12th annual flea market and computer show on Sunday, April 1, 1984, from 8:00 am to 4:00 pm, at the New Jersey National Guard 112th Field Artillery Armory, Eggerts Crossing Road, Lawrence Township, Trenton NJ. There will be an indoor and outdoor flea-market area, commercial dealers, and refreshments. Sellers are asked to bring their own tables. Talk-in on 146.52 and 146.07/.67. For advance tickets and space reservations, please send an SASE to Walter L. Sharpe KB2ZY, 140 Susan Drive, Trenton NJ 08638.

CHICAGO IL
APR 4

The Chicago Amateur Radio Club will hold an open house on Wednesday, April 4, 1984, from 7:00 pm to 10:00 pm, at Edgebrook Golf Course Field House, 6100 N. Central Avenue, Chicago IL. Everyone is welcome—especially those interested in learning about amateur radio and how to obtain a license. There will be a film shown and live demonstrations of all aspects of amateur-radio communications and equipment. For additional information, call (312)-545-3622.

ROCHESTER NH
APR 7

The Great Bay Radio Association will hold its 4th annual hamfest/flea market, Springfest '84, on Saturday, April 7, 1984, from 9:00 am to 3:00 pm, at the Rochester VFW Post 1772 Hall, Pickering Road, Rochester (Gonic) NH. Admission is $1.00. Food, refreshments, and plenty of free parking will be available. Talk-in on 147.57. For advance table reservations and further information, write Great Bay Radio Association, PO Box 911, Dover NH 03820.

SAN ANTONIO TX
APR 7

The San Antonio Area Radio Club will hold its first annual Swapfest and Bar-B-Q on April 7, 1984, from 7:00 am to 5:00 pm, at Comanche Park. Talk-in on 147.36 MHz. For more details, write Melvin Anderson, 8932 Saddle Trail, San Antonio TX 78255.

ROCHESTER MN
APR 7

The Rochester Amateur Radio Club and the Rochester Repeater Society will sponsor the 7th annual Rochester Area Hamfest on Saturday, April 7, 1984, beginning at 8:30 am, at John Adams Junior High School, 2535 NW 31 Street, Rochester MN. There will be a large indoor flea market for radio and electronic items, refreshments, and plenty of free parking. Talk-in on 146.22/.82 MHz. For further information, contact RARC, c/o W. C. McGurk WB0YEE, 2253 Nordic Court NW, Rochester MN 55901.

FLEMINGTON NJ
APR 7

The Cherryville Repeater Association will sponsor the annual Flemington NJ Hamfest on Saturday, April 7, 1984, from 8:00 am to 3:00 pm, at the Hunterdon County High School Field House on Route 31. General admission is $3.00. For early birds, breakfast will be available on site from 6:30 am. Talk-in on 147.375, 147.015, 146.52, 224.12, and 444.85. For additional information or table reservations, write Bill Inkrote K2NJ, RD 10, Box 294, Quakertown-Croton Road, Flemington NJ 08822, or call (201)-788-4080.

GREENCASTLE IN
APR 7

The Putnam County Amateur Radio Club will hold its second Amateur Radio and Electronics Auction on April 7, 1984, at the Putnam County Fairgrounds, US 231, north of Greencastle IN. Admission is $1.00, sales commission is 5%, and there will be a $1.00 service charge on buybacks. Doors will open at 8:00 am and the auction will start at 10:00 am. Bring your equipment to be sold on consignment. All activities will be inside and food will be available. Talk-in on 147.93/.33. For more information or a flyer, contact John Underwood K9IIB, RFD 1, Box 10, Fillmore IN 46128.

KANSAS CITY MO
APR 7-8

The PHD Amateur Radio Association, Inc., will sponsor the 1984 Missouri State ARRL Convention on Saturday and Sunday, April 7-8, 1984, from 10:00 am to 5:30 pm (both days), at the Trade Mart Building, at the downtown Kansas City MO airport. For both days, registration is $4.00 and swap tables are $10.00, which includes one registration with each table. Commercial exhibitors may set up from 7:00 pm to 9:00 pm on Friday or 7:00 am to 10:00 am on Saturday; swappers may set up at 9:00 on Saturday. The Saturday-night banquet at the world-famous Gold Buffet is $10.50. Those desiring banquet tickets and swap tables are urged to order in advance. Other features will be a complete program of forums, commercial booths, a large flea market, a home-brew contest, Missouri-Kansas Amateur-of-the-Year and CW Contest awards, and on Sunday, a Missouri-Kansas Repeater Council meeting, as well as QCWA and YL luncheons. Unlimited free parking, including RV space (no hookups), will be available. Talk-in on 146.34/.94. For more information and registrations, write PHD Amateur Radio Association, Inc., Liberty MO 64068-0011, or call (816)-781-7313 or 452-9321. All pre-registrations will be held at the door.

AMBOY IL
APR 8

The 19th annual Rock River ARC Hamfest will be held on Sunday, April 8, 1984, beginning at 8:00 am, at the Lee County 4-H Center, one mile east of the junction of 52 and 30. Ticket donations are $2.00 each in advance and $3.00 at the gate; 8-foot tables are $5.00 each. Camping space will be available for a nominal charge and breakfast and lunch will be served. There will be an auction of amateur-related gear. Talk-in on .37/.97 repeater. For more information or advance tickets (available until April 1, 1984) and tables, write to Shirley Webb KA9HGZ, 618 Orchard Street, Dixon IL 61021, or phone (815)-284-3811.

MADISON WI
APR 8

The Madison Area Repeater Association, Inc. (MARA), will hold its 12th annual Madison Swapfest on Sunday, April 8, 1984, at the Dane County Exposition Center Forum Building in Madison WI. Admission is $2.50 per person in advance and $3.00 at the door. Children twelve and under will be admitted free. Flea-market tables are $4.00 each in advance and $5.00 at the door. Doors will open at 5:00 am for commercial exhibitors, 8:00 am for flea-market sellers, and 9:00 am for the general public. Features will include commercial exhibitors, a flea market, an all-you-can-eat pancake breakfast, and a barbecue lunch. Plenty of parking space and nearby hotel accommodations are available. Talk-in on 146.16/.76 (WB9AER/R). For reservations (early ones are advised) or more information, write to MARA, PO Box 3403, Madison WI 53704.

MUSKEGON MI
APR 14

The Muskegon Area Amateur Radio Council will hold the ARRL Michigan State Convention and Muskegon Hamfest on April 14, 1984, at the L. C. Walker Arena, 4th at Western, Muskegon MI. Features will include Friday-evening hospitality rooms, programs covering areas of amateur radio interest, ladies' activities, and a Saturday-evening convention *dinner* program. Setups for manufacturers and dealers will begin at 2:00 pm on April 13th. For more information, write Muskegon Area Amateur Radio Council, PO Box 691, Muskegon MI 49443.

WELLESLEY MA
APR 14

The Wellesley Amateur Radio Society will conduct its annual auction on Saturday, April 14, 1984, at the First Congregational Church of Wellesley Hills, 207 Washington Street, at the intersection of Routes 9 and 16, Wellesley MA. Doors will open at 10:00 am and the auction will begin at 11:00 am. Talk-in on .63/.03, .04/.64, and .52. For more information, contact Kevin P. Kelly WA1YHV, 7 Lawnwood Place, Charlestown MA 02129.

PIKES PEAK CO
APR 14-15

The Pikes Peak Radio Amateur Association will present the 1st annual Electronic Exhibition and Trade Show on Saturday and Sunday, April 14-15, 1984, from 10:00 am to 6:00 pm, at a site soon to be confirmed. A fee will be charged at the door. Well-known equipment manufacturers will present seminars on Saturday, starting at 1:00 pm, and admission will be free. Live TV and radio broadcasts will be on during the show. Talk-in on 146.52 simplex or 146.97/.37.

JACKSON MS
APR 14-15

The Jackson Amateur Radio Club will host the Capital City Hamfest and 1984 ARRL Mississippi State Convention on Saturday and Sunday, April 14-15, 1984, at the Communications Workers of America Building, I-220 at Country Club Drive. Hours on Saturday are 9:00 am to 5:00 pm and on Sunday, 8:00 am to 1:30 pm. Admission is free and flea-market tables are $5.00 each. Attractions include commercial dealer exhibits, a large indoor flea market, concessions, forums, and free parking (including self-contained RVs). For special hamfest rates, contact the Holiday Inn Southwest directly. Talk-in on 146.16/.76. For further information, contact Carol Kemp NA5Y, 3581 Beaumont Drive, Pearl MS 39208, or phone (601)-939-7612.

RALEIGH NC
APR 15

The Raleigh Amateur Radio Society will hold its 12th annual hamfest and flea market (all under cover) on Sunday, April 15, 1984, beginning at 8:00 am, at the Crabtree Valley Shopping Mall, located at the intersection of US 70 west and US 1 and 64. Admission is $4.00 at the gate, with no extra charge for tailgaters. Tables will be available for rent. Features will include a CW contest, a home-brew contest, and special-interest meetings. Talk-in will be on 146.04/146.64 (W4DW) and 146.28/146.88 (K4ITL). For more information, contact Pete Thacher N4HQZ at (919)-876-4073 or Jim Bradley WA4AOO at (919)-851-2437 from 6:00 pm to 8:00 pm weekdays or on weekends, or write RARS, PO 19127, Raleigh NC 27619.

DAYTON OH
APR 27

The 15th annual B*A*S*H will be held on Friday night, April 27, 1984, at the Dayton Hamvention at the Convention Center, Main and Fifth Streets, Dayton OH. Admission is free and parking is available in the adjacent city garage. There will be sandwiches, snacks, and a COD bar, as well as live entertainment. For further information, contact the Miami Valley FM Association, PO Box 263, Dayton OH 45401.

DAYTON OH
APR 27

The Dayton-Cincinnati Chapter of the Quarter Century Wireless Association will hold its annual banquet during the Dayton Hamvention on Friday, April 27, 1984, at Neil's Heritage House Restaurant, 2189 S. Dixie Drive, Dayton OH. Tickets are $12.50. The cash bar will open at 6:30 pm and dinner will begin at 7:30 pm. The dinner speaker is Dr. Jerrold Petrofsky, developer of computerized equipment that enables paraplegics to walk. The presentation will be illustrated. For more details, write Doug Horner W8PH, 186 Golfwood Drive, Dayton OH 45449, or call (513)-859-3210.

DAYTON OH
APR 27-29

The 1984 Dayton Hamvention's International VHF/UHF Conference will be held concurrently with the Hamvention from Friday through Sunday, April 27-29, 1984, at the Hara Arena and Exhibition Center, Dayton OH. There will be technical forums by acknowledged experts; noise-figure, dynamic-range, and antenna-range measurement contests; and a hospitality suite with refreshments. Technical papers and presentations on VHF/UHF topics of interest are being solicited for consideration. Potential speakers should submit their requests immediately. For further information, contact Jim Stitt WA8QNQ, VHF/UHF Conference Moderator, 4126 Crest Manor, Hamilton OH 45011.

DAYTON OH
APR 27-29

The Dayton Amateur Radio Association, Inc., will sponsor the Dayton Hamvention on April 27-29, 1984, at the Hara Arena and Exhibition Center, Dayton OH. Admission, valid for all three days, is $7.50 in advance and $10.00 at the door. The Saturday evening Grand Banquet and Entertainment is $14.00 in advance and $16.00 at the door. Harry Dannals W2HD, past president of the ARRL, will be the featured speaker. Because seating is limited, early reservations are requested. There will be a giant flea market starting at noon on Friday and continuing all day Saturday and Sunday. Flea-market space is $15.00 for all three days and will be sold in advance only. Entrance for setups will be available starting Wednesday and the special flea-market telephone is (513)-223-0923. Other features will include forums, awards, and exhibits. For special motel rates and reservations, write Hamvention Housing, Box 1288, Dayton OH 45402; no telephone reservations will be accepted. Address all other inquiries to Box 44, Dayton OH 45401, or phone (513)-433-7720. Please send advance registration checks to Dayton Hamvention, Box 2205, Dayton OH 45401.

HARTWELL GA
APR 28-29

The Anderson, Hartwell, and Toccoa Ham Clubs will sponsor the sixth annual Lake Hartwell Hamfest on April 28-29, 1984, at the Lake Hartwell Group Camp located on Highway 29, about 2 miles south of Hartwell Dam. Admission, camping, and flea-market space are all free. Activities will begin at 9:00 am on Saturday and include a horseshoe tournament and a left-footed CW contest. The camping area will be open Friday and Saturday nights. Talk-in on 146.895/.295 and 146.19/.79. For further information, contact Carl Davis KY4T, 203 College Avenue, Hartwell GA 30643.

EAST HARTFORD CT
APR 29

The seventh annual Pioneer Valley Radio Association (PVRA) Flea Market will be held on Sunday, April 29, 1984, from 10:00 am to 4:00 pm, at Penney High School, Forbes Street, East Hartford CT. Talk-in on .19/.79. For reservations and more information, write Jon Patz KA1FYL, 34 Whiting Lane, West Hartford CT 06119, or call (203)-232-8772 (evenings).

BRAINTREE MA
APR 29

The South Shore Amateur Radio Club of Braintree MA will celebrate its 53rd year in amateur radio by holding an indoor flea market on Sunday, April 29, 1984, rain or shine, from 11:00 am to 4:00 pm, at the Viking Club, 410 Quincy Avenue, Braintree MA. The entrance fee is $1.00 and 8-foot tables are $10.00 (which includes 1 free admission per table). Vendors will be admitted at 9:30 am and plenty of parking will be available. For advance table reservations, send a check payable to the South Shore Amateur Radio Club to Ed Doherty W1MPT, 236 Wildwood Avenue, Braintree MA 02184. A confirmation of check receipt will be sent and there will be no cancellation refunds after April 25. For more information, call Ed at (617) 843-4431, evenings.

CHICAGO IL
MAY 2

The Chicago Amateur Radio Club's Evening Mini-Hamfest will be held on Wednesday, May 2, 1984, from 6:00 pm to 10:00 pm, at the Edgebrook Golf Course Field House, 6100 N. Central (between Elston and Devon), Chicago IL. Admission is $1.00 and card-table spaces are $3.00. Refreshments will be available. Talk-in on 146.52 MHz. For tickets, space reservations, or more information, send an SASE to CARC, 5631 W. Irving Park Road, Chicago IL 60634, or phone (312)-545-3622.

ST. DAVID AZ
MAY 4-6

The Cochise Amateur Radio Association, Inc., will hold a hamfest (upgraded from a swapmeet) on May 4-6, 1984, in St. David AZ. There will be a flea market and all tailgaters are welcome. Tours planned to Tombstone, the Bisbee Lavender Pit, and other places of interest. Talk-in on .16/.76 and .52 simplex. For more details, contact CARA, Attention: Bob Clay KB7HB, PO Box 1855, Sierra Vista AZ 85636.

CEDARBURG WI
MAY 5

The Ozaukee Radio Club will sponsor its 6th annual swapfest on Saturday, May 5, 1984, from 8:00 am to 1:00 pm, at the Circle B Recreation Center, Highway 60, Cedarburg WI (located 20 miles north of Milwaukee). Admission is $2.00 in advance and $3.00 at the door. Six-foot tables are $2.00 and eight-foot tables are $3.00. Food and refreshments will be available. Sellers will be admitted at 7:00 am for table setups. For tickets, tables, maps, or more information, send a business-size SASE to 1984 Ozaukee Radio Club Swapfest, PO Box 13, Port Washington WI 53074.

COLUMBIA MO
MAY 5-6

The Central Missouri Radio Association will hold Columbia Hamfest '84 on May 5-6, 1984, at the Hilton Inn, I-70 and Stadium Boulevard, Columbia MO. Features will include forums, a hospitality room, a Saturday-night banquet, a hard-surfaced flea market, display tables, and shuttle-bus service to parking areas and shopping centers. Talk-in on .16/.76 or 220.42/.02. For banquet tickets, reservations for hotels, flea-market spaces, or dealer tables, and more information, contact Ben Smith K0PCK, Route 1, Prairie Home MO 65068, or phone (816) 427-5319.

GREENVILLE SC
MAY 5-6

The Blue Ridge Amateur Radio Society will sponsor the Greenville SC Hamfest on Saturday and Sunday, May 5-6, 1984, at the American Legion Fairgrounds, White Horse Road, ½ mile north of I-85, Greenville SC. Admission is $3.00 in advance and $4.00 at the door. Talk-in on 146.01/.61. For advance tickets, write Mrs. Sue Chism N4ENX, Rte. 6, 203 Lanewood Drive, Greenville SC 29607. For further information, write Phil Mullins WD4KTG, Hamfest Chairman, PO Box 99, Simpsonville SC 29681.

LONG ISLAND
MAY 6

The Suffolk County Radio Club Indoor and Outdoor Flea Market will be held on Sunday, May 6, 1984, from 8:00 am to 3:00 pm, at Republic Lodge No. 1987, 585 Broadhollow Road (Route 110), Melville NY. General admission is $2.00; children under 12 and wives will be admitted free. Indoor seller's tables are $7.00 and outdoor space is $5.00 (includes one admission). There will be refreshments on the premises and plenty of free parking. Talk-in on 144.61/145.21 and 146.52. For additional information, contact Richard Tygar AC2P at (516)-643-5956 (evenings).

SULLIVAN IL
MAY 6

The Moultrie Amateur Radio Klub will hold its annual Sullivan IL MARK Hamfest on May 6, 1984, at the 4-H Fairgrounds, 3 miles east and 1 mile north of Sullivan on the Cadwell Road. Features include covered facilities, lunch, and a free swapper's row. Talk-in on 146.655/.055 and 146.520. For more information, contact William Guennewig WA9WOB at (217)-268-3139 (evenings).

SANDWICH IL
MAY 6

The Kishwaukee Radio Club of DeKalb IL will hold its annual hamfest on Sunday, May 6, 1984, at the Sandwich Fairgrounds, Sandwich. Tickets are $2.50 in advance and $3.00 at the door; tables are $5.00 each. Overnight camping without hookups will be available. For more information, contact Howard Newquist WA9TXW, PO Box 349, Sycamore IL 60178.

CENTRALIA IL
MAY 6

The Centralia Wireless Association, Inc., will hold its annual hamfest on Sunday, May 6, 1984, at the Kaskaskia College Gymnasium, 3 miles northwest of Centralia IL. Admission to the hamfest is free and there will be no charge for the flea-market and exhibit space (a limited number of tables will be issued on a first-come, first-serve basis). Doors will open at 7:00 am for flea-market and exhibit setups. Food and refreshments will be available, as well as plenty of free parking. Talk-in on 147.27/.87 and 146.52. For further information, contact Bud King WB9QEG at (618)-532-6606 or Lou Hodges W9IL at (618)-533-4724, or write to CWA, Inc., PO Box 1166, Centralia IL 62801.

PARAMUS NJ
MAY 6

The Bergen ARA will hold a Ham Swap 'n' Sell on May 6, 1984, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. There will be tailgating only and admission for sellers is $4.00 (bring your own table). Buyers will be admitted free. Talk-in on .79/.19 and .52. For more information, contact Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855.

DURHAM NC
MAY 12

The Durham FM Association will hold the Durham Hamfest on May 12, 1984, at the South Square Mall, Durham NC. Talk-in on 147.225. For more information, write Milan R Burger, President, DFMA, 5711 Spruce Drive, Durham NC 27712.

RESPONSE FORM

Instructions: Read each question and mark your response by circling the appropriate letter next to the number of the question.

Element 1:	7) A B C D E	12) A B	19) A B	*Element 3:*	31) A B	38) A B	45) A B C D E
1) A B	8) A B C D E	13) A B C	20) A B	25) A B	32) A B	39) A B C D E	46) A B C D E
2) A B C D E	9) A B C D E	14) A B	21) A B	26) A B	33) A B C D E	40) A B	47) A B C D E
3) A B C D E	10) A B C D E	15) A B C D E	22) A B	27) A B	34) A B C D E	41) A B	48) A B C D E
4) A B C D E		16) A B	23) A B	28) A B	35) A B	42) A B	49) A B
5) A B	*Element 2:*	17) A B	24) A B	29) A B	36) A B	43) A B	50) A B
6) A B C D E	11) A B C	18) A B C		30) A B	37) A B		

Comments: ______________________________

23) Should ham licenses have a minimum age requirement?
A) Yes
B) No

24) Should hams be subject to periodic retesting?
A) Yes
B) No

ELEMENT 3—OPERATING HABITS

25) If the users were restricted to data communication only (no phone or CW operation), would you be in favor of a no-code 220-MHz Digital-class license?
A) Yes
B) No

26) Would you be in favor of a no-code 220-MHz Digital-class ticket if it permitted phone operation in addition to data transmission?
A) Yes
B) No

27) Have you ever used a personal computer in connection with your amateur-radio activities?
A) Yes
B) No

28) Is it time to completely deregulate amateur radio by having the FCC turn over all responsiblity for ham operation to the amateur community?
A) Yes
B) No

29) What do you think of people who view pay-television services with MDS converters and satellite dishes that are not approved by broadcasters?
A) They're skunks
B) They're within their rights

30) Should we get rid ot, or reduce in size, the CW subbands?
A) Yes
B) No

31) Do you think DX nets have a place in ham radio?
A) Yes
B) No

32) Do you think nets in general have a place in ham radio?
A) Yes
B) No

33) The next time a ham operates from space, which band should he/she use?
A) 2 meters
B) 220 MHz
C) 450 MHz
D) An even higher band
E) Shouldn't bother to operate

34) If, while tuning across a band, you heard a net called "Jammers International" in progress, would you:
A) Jam it
B) Ignore it
C) Complain to the FCC or some other organization
D) Listen
E) Join it

35) If required, could you solidly copy CW at the speed at which you were licensed?
A) Yes
B) No

36) If required, could you pass the FCC theory test for your license class?
A) Yes
B) No

37) Have you ever purposely operated in an amateur subband you weren't licensed to use?
A) Yes
B) No

38) Do you think the ARRL affects amateur radio in a positive manner?
A) Yes
B) No

39) Do you ever speak to foreign, non-English-speaking, hams in their own language?
A) Always
B) Sometimes
C) I attempt it
D) Rarely
E) Never

40) Do you feel yourself competent to replace the finals in a tube-type rig?
A) Yes
B) No

41) Do you feel yourself competent to replace the finals in a transistor-type rig?
A) Yes
B) No

42) Do you solder together your own coax connectors?
A) Yes
B) No

43) Is your antenna system mounted on your house or a tower?
A) House
B) Tower

44) Have you ever designed your own antenna?
A) Yes
B) No

45) What do you think of contesting?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

46) What do you think of DXing?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

47) What do you think of repeaters?
A) Great
B) Good
C) Okay
D) Don't like them
E) Despise them

48) What do you think of traffic handling?
A) Great
B) Good
C) Okay
D) Don't like it
E) Despise it

49) If you heard an emergency net in progress, would you immediately join in and offer your services?
A) Yes
B) No

50) Should all hams be required to join some type of national amateur-radio organization?
A) Yes
B) No

FCC

47 CFR Part 97

[PR Docket No. 83-27; RM-4229]

Allow the Use of Volunteers to Prepare and Administer Operator Examinations in the Amateur Radio Service and Correction

AGENCY: Federal Communications Commission.

ACTION: Final Rules and Correction.

SUMMARY: This document corrects FCC rules regarding the use of voluntary and uncompensated volunteers to prepare and administer amateur operator examinations in order to eliminate unintended inconsistencies in the rules adopted in the *Report and Order* in this proceeding.

EFFECTIVE DATE: January 11, 1984.

FOR FURTHER INFORMATION CONTACT: John J. Borkowski, Federal Communications Commission, Washington, D.C. 20554, (202) 632-4964.

Errata

In the matter of amendment of Parts 0, 1 and 97 of the Commission's rules to allow the use of volunteers to prepare and administer operator examinations in the Amateur Radio Service (PR Docket No. 83-27 RM-4229).

Released: December 30, 1983.

1. On September 22, 1983, the Commission adopted a *Report and Order*, 48 FR 45653 (October 6, 1983), in the above captioned proceeding. In the *Report and Order*, the Commission amended Parts 0, 1 and 97 of its Rules to allow the use of volunteers to prepare end administer operator examinations in the Amateur Radio Service.

2. In the rules set forth in the Appendix to the *Report and Order*, volunteers are given ten days from the time they administer an examination to forward candidates' applications to the VEC (§ 97.28(h)). However, VEC's are given only ten days from the date of the examination to forward candidates' applications to the FCC (§ 97.519(c)). This could result in a VEC having no time to perform the functions listed in § 97.519, and was not intended. The Commission intended to give the VEC adequate time to perform these functions.

3. At paragraph 28 of the *Report and Order*. The Commission stated: ". . . we have incorporated all of the present telegraph requirements and guidelines from our present rules." With respect to telegraphy examination grading, no changes were intended. However, § 97.29 (c) in the Appendix imposed an additional burden not included in the present rules of grading on the basis of "one continuous minute." Inclusion of this new burden was not intended.

4. Sections 97.503 and 97.515 of the Rules in the Appendix cross-reference § 97.30. There is no § 97.30. The cross-references should be deleted.

5. Section 97.28(i)(2) provides for FCC retesting of any person who obtained an operator license through the volunteer examination process. It does not indicate what the FCC will do if such a person does not pass the examination. This was an inadvertent omission. Therefore, we are adding a new paragraph (j) to § 97.28 to clarify that an examinee who fails to appear for readministration of an examination or who fails to pass the retested examination element(s) will have his/

her operator's license cancelled and will be issued a new operator license for the operator license class previously held by the examinee. We are also clarifying that FCC retesting applies only for examinations above the Novice Class.

6. Additionally, the definition of the term "Amateur Code Credit Certificate" in § 97.3 was inadvertently retained.

7. Finally, the wording of § 97.513 regarding where VEC's may coordinate examinations is unintentionally ambiguous. While this wording was designed to permit VEC's to coordinate examinations outside of the regions listed in § 97.507(b) (such as United States military bases in foreign countries), it was not intended to permit one regional VEC to coordinate examinations in another region.

8. Accordingly, the following corrections are made to the Appendix of the *Report and Order* in this proceeding:

§ 97.3 [Corrected]

1. Paragraph (aa) of § 97.3 is removed and reserved.

2. Section 97.28 is amended by revising paragraph (i) and adding a new paragraph (j) as follows:

§ 97.28 Examination administration.

* * * * *

(i) The FCC reserves the right, without qualification, to:

(1) Administer examinations itself; *or*

(2) Readminister examinations itself or under the supervision of an examiner designated by the FCC to any person who obtained an operator license above the Novice Class through the volunteer examination process.

(j) If a licensee fails to appear for readministration of an examination pursuant to paragraph (i)(2) of this section, or does not successfully complete the examination element(s) which are readministered, the licensee's operator license is subject to cancellation; in an instance of such cancellation, the licensee will be issued an operator license consistent with completed examination elements which have not been invalidated by not appearing for or failing readministration of an examination.

3. The words "for one continuous minute" are removed from the first sentence of paragraph (c) of § 97.29.

4. The cross-references to § 97.30 are removed from § 97.503(b) and from § 97.515.

5. The first two sentences of § 97.513 are revised to read:

§ 97.513 Scheduling of examinations.

A VEC will coordinate the dates and times for scheduling examinations (see § 97.26) throughout the region(s) it serves. Any VEC may also coordinate the scheduling of testing opportunities outside of the regions listed in § 97.507(b).

* * * * *

6. Paragraph (c) of § 97.519 is revised to read:

§ 97.519 Examination procedures.

* * * * *

(c) Forward the application within ten days of its receipt from the examiners to: Federal Communications Commission, Licensing Division, Private Radio Bureau, Gettysburg, Pennsylvania 17325.

* * * * *

(Secs. 4(i) and 303 of the Communications Act of 1934, as amended, 47 U.S.C. 154(i) and 303)

Federal Communications Commission.

William J. Tricarico,

Secretary.

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47 CFR Part 97

[PR Docket No. 83-584; FCC 84-16]

Making Additional Frequencies Available to the Radio Amateur Civil Emergency Service During Declared National Emergencies

AGENCY: Federal Communications Commission.

ACTION: Final rules.

SUMMARY: This document amends the Amateur Radio Service Rules to make additional frequencies available to the Radio Amateur Civil Emergency Service (RACES) during declared national emergencies. Additional RACES frequencies are needed since, even in peacetime, the number of RACES frequencies are inadequate. The effect of this action is to assure that sufficient RACES frequencies would be available if the President invokes the war emergency powers.

EFFECTIVE DATE: March 28, 1984.

ADDRESS: Federal Communications Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT: Maurice J. DePont, Private Radio Bureau, Washington, D.C. 20554.

List of Subjects in 47 CFR Part 97

Civil defense, Defense communications, Radio.

Report and Order

In the matter of amendment of the Amateur Radio Service Rules, Part 97, to make additional frequencies available to the Radio Amateur Civil Emergency Service during declared national emergencies (PR Docket No. 83-524).

Adopted: January 16, 1984.

Released: January 19, 1984.

By the Commission.

1. On May 26, 1983, the Commission adopted a Notice of Proposed Rule Making (48 FR 26647; June 9, 1983) proposing to make additional frequencies available to the Radio Amateur Civil Emergency Service (RACES) in the event of an emergency which causes the President to invoke certain war emergency powers, pursuant to Section 606 of the Communications Act of 1934, as amended. Also proposed were operational limitations on the additional frequencies so as to provide protection to the Government Radiolocation Service, to the Aeronautical Radionavigation Service and to Canadian radio stations. The restrictions that limited RACES operations to thirty days and to specific geographical areas were also proposed to be deleted. Nineteen comments were filed in this proceeding.

2. This proceeding originated in response to a request from the Department of Defense (DOD), through the National Telecommunications and Information Administration (NTIA) and the Interdepartmental Radio Advisory Committee (IRAC), for additional frequencies for RACES stations during a declared national emergency. DOD had reviewed the role of RACES in support of civil defense activities during a national emergency declared by the President and had concluded that additional RACES frequencies are needed under war emergency conditions. DOD said that since the presently available RACES frequencies have proven inadequate in peacetime, they would be completely unsatisfactory in wartime. In addition, DOD noted that although the number of amateur radio repeater stations have increased, they operate on frequencies which are not now available to RACES. Hence, DOD wanted the frequencies that repeaters operate on made available to RACES stations. For the same reason, DOD asked that frequencies used by high frequency (HF) nets also be made available to RACES stations. The deletion of the restriction on the use of certain RACES frequencies to the initial 30 days of the emergency and the areas where they could be used was proposed since those restrictions are no longer needed.

3. The comments generally supported the proposal to make additional frequencies available to RACES stations.[1] Robert N. Dyruff wanted all of the Amateur Radio Service frequencies made available to RACES. He also suggested that the RACES rules should be deleted in their entirety and replaced by a joint working arrangement between the Federal Emergency Management Agency, State Offices of Emergency Services and local organizations of amateur radio operators. The suggestions of Mr. Dyruff are so broad as to exceed the scope of this proceeding. In our Notice of Proposed Rule Making, we proposed to make the frequencies 146-148 MHz available for RACES operations. Several of the commenters, however, suggested that the repeater subband 144.50-145.50 MHz be included for RACES operation. In this connection, the American Radio Relay League, Inc. (ARRL) stated that this would make it unnecessary for anyone to alter existing equipment, especially repeaters, to operate on RACES frequencies during a declared emergency, since Amateur Radio Emergency Service (ARES) members could switch from ARES to RACES immediately without a shift in equipment.

4. We referred the matter of inclusing the subband 144.50-145.50 MHz to DOD (through IRAC). It interposed no objection. Therefore, since inclusion of these frequencies will bring more repeaters into RACES operation and will expand the potential for use of RACES stations in the future, we will include the 144.50-145.50 MHz subband in these final rules. Some commenters suggested that additional frequencies in the 6, 10, 40, and 75-meter bands be added for RACES operations. Those frequencies were not included in DOD's original request. Therefore, we have not included them in these final rules.

5. In our proposal, we stated that additonal amateur radio frequencies in the 10 MHz and 18 MHz frequency bands might also be considered if the United States ratified the final acts of the World Administrative Radio Conference (WARC), 1979. Although such ratification took place on September 6, 1983, it would not be appropriate to include those frequencies in this Report and Order since the Amateur Rules have not yet been amended to make those bands available for use in the Amateur Radio Service on a regular basis.

6. We will adopt the rules as proposed, with the inclusion of the additional 2-meter band frequencies. The thirty day limitation on the use of the frequencies is deleted since the use of amateur frequencies for RACES would undoubtedly be authorized beyond the thirty day period if an emergency continued beyond that time. Also, we have deleted the geographic limitations since to retain them could hinder emergency communications between the continental United States and the States of Hawaii or Alaska, or between the continental United States and U.S. possessions. These latter amendments are in keeping with our continuing efforts to eliminate unnecessary rules and restrictions. Finally, necessary corrections have been made to the table in § 97.185(b).

7. It is ordered, that Pert 97 is amended as set forth in the Appendix hereto. This action is taken pursuant to the authority contained in Sections 4(i) and 303(r) of the Communications Act of 1934, as amended. It is further ordered, that these rule amendments shall become effective March 28, 1984.

8. It is further ordered, that the Secretary shall cause a copy of this Report and Order to be published in the Federal Register.

9. It is further ordered, that this proceeding is terminated.

10. Information in this matter may be obtained by contacting Maurice J. Depont, (202) 632-4904, Private Radio Bureau, Federal Communications Commission, Washington, D.C. 20554.

Federal Communications Commission.

William J. Tricarico,

Secretary.

[1] The late-filed comments of John A. Carroll are accepted and have been considered insofar as they relate to this proceeding.

Appendix

PART 97—[AMENDED]

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

1. Section 97.185 is revised to read as follows:

§ 97.185 Frequencies available.

(a) All of the authorized frequencies and emissions allocated to the Amateur Radio Service are also available to the Radio Amateur Civil Emergency Service on a shared basis.

(b) In the event of an emergency which necessitates the invoking of the President's War Emergency Powers under the provisions of § 606 of the Communications Act of 1934, as amended, unless otherwise modified or directed, RACES stations and amateur radio stations participating in RACES will be limited in operation to the following:

FREQUENCY OR FREQUENCY BANDS—Continued

	Limitations
kHz:	
1800-1825	
1975-2000	1
3500-3550	
3930-3980	
3984-4000	
3997	2
7079-7125	
7245-7255	
14047-14053	
14220-14230	
14331-14350	
21047-21053	
21228-21267	
MHz:	
28.55-28.75	
29.237-29.273	
29.45-29.65	
50.35-50.75	
53.30	2
53.35-53.75	
144.50-145.71	
146-148	
220-225	4
420-450	3, 5, 6
1240-1300	3
2390-2450	3

(c) *Limitations.* (1) Use of frequencies in the band 1975-2000 kHz is subject to the priority of the LORAN system of radionavigation in this band and to the geographical, frequency, emission, and power limitations contained in § 97.61 (Subpart C of this part pertaining to Technical Standards).

(2) For use in emergency areas when required to make initial contact with a military unit; also, for communications with military stations on matters requiring coordination.

(3) Those stations operating in the bands 420-450, 1240-1300 and 2390-2450

MHz shall not cause harmful interference to, and must tolerate any interference from, the Government Radiolocation Service; and also the Aeronautical Radionavigation Service in the case of the 1240-1300 MHz band.

(4) Those stations operating in the band 220-225 MHz shall not cause harmful interference to, and must tolerate any interference from, the Government Radiolocation Service until January 1, 1990. Additionally, the Fixed and Mobile Services shall have equal right of operation.

(5) In the band 420-430 MHz, no station shall operate North of Line A. Line A begins at Aberdeen, Washington, running by great circle arc to the intersection of 48° N., 120° W., thence along parallel 48° N., to the intersection of 95° W., thence by great circle arc through the southernmost point of Duluth, Minn., thence by great circle arc to 45° N., 85° W., thence southward along meridian 85° W., to its intersection with parallel 41°N., thence along parallel 41° N., to its intersection with meridian 82° W., thence by great circle arc through the southernmost point of Bangor, Maine, thence by great circle arc through the southernmost point of Searsport, Maine, at which point it terminates.

(6) In the band 420-450 MHz and within the following areas, the peak envelope power output of a transmitter used in the Amateur Radio Service shall not exceed 50 watts, unless expressly authorized by the Commission after mutual agreement, on a case-by-case basis, between the Federal Communications Commission Engineer-in-Charge at the applicable District Office and the Military Area Frequency Coordinator at the applicable military base:

(i) Those portions of Texas and New Mexico bounded on the south by latitude 31° 45' North, on the east by longitude 104° 00' West, on the north by latitude 34° 30' North, and on the west by longitude 107° 30' West;

(ii) The entire State of Florida including the Key West area and the areas enclosed within a 200-mile radius of Patrick Air Force Base, Florida (latitude 28° 21' North, longitude 80° 43' West), and within a 200-mile radius of Eglin Air Force Base, Florida (latitude 30° 30' North, longitude 86° 30' West);

(iii) The entire State of Arizona;

(iv) Those portions of California and Nevada south of latitude 37° 10' North, and the areas enclosed within a 200-mile radius of the Pacific Missile Test Center, Point Mugu, California (latitude 34° 09' North, longitude 119° 11' West).

(v) In the State of Massachusetts within a 160-kilometer (100 mile) radius around locations at Otis Air Force Base, Massachusetts (latitude 41° 45' North, longitude 70° 32' West).

(vi) In the State of California within a 240-kilometer (150 mile) radius around locations at Beale Air Force Base, California (latitude 39° 08' North, longitude 121° 28' West).

(vii) In the State of Alaska within a 160-kilometer (100 mile) radius of Clear, Alaska (latitude 64° 17' North, longitude 149° 10' West). (The Military Area Frequency Coordinator for this area is located at Elmendorf Air Force Base, Alaska.)

(viii) In the State of North Dakota within a 160-kilometer (100 mile) radius of Concrete, North Dakota (latitude 48° 43' North, longitude 97° 54' West). (The Military Area Frequency Coordinator for this area can be contacted at: HQ SAC/SXOE, Offutt Air Force Base, Nebraska 68113.)

LETTERS

PET PEEVE, CROSS LINK

W1UKZ's article ("Breakthrough In Boston: The Birth of Crosslinking," 73, January, 1984) provides me with an opportunity to air a pet peeve about wiring diagrams shown as schematics.

A drawing such as shown in Fig. 2 of David's article may be good to use while wiring the unit, but a "flow-of-information" type of drawing would better help the reader understand what the writer is saying.

This is an excellent article, doing just what 73 does best—breaking new ground. Keep up the good work.

W. S. (Bill) Kemper W4KOF
Miami FL

Your comments make sense, Bill, but to avoid drawing two diagrams I think that a circuit description a la good old BSP (Bell System Practices) would make better sense. That way we need show only the wiring diagram (most necessary). I have written such a circuit description for the crosslink logic box. (See below.)

I notice that in redrawing the circuit you found the error in the original drawing with the article. Pin 9 of RY1 does NOT connect to the microphone circuit as shown but, instead, should connect to the top of the coil of RY1, contact 13.

Thank you very much for your insight, Bill.—David P. Allen W1UKZ

CIRCUIT DESCRIPTION

When connected as shown in Fig. 2 and turned on with both rigs powered, the circuit defaults to receive mode in both transceivers. Signals normally would be heard via external speakers (not shown) paralleling the external speaker circuits for each rig. None of the LEDs will be illuminated.

When microphone PTT switch is closed, ground pin 1 of RY3 is grounded through D6, operating RY3. RY3 contacts 4 and 8 close, illuminating LED2 to indicate microphone "on" condition. PTT ground is passed through normally-closed contacts 3 and 11 of RY1 and RY2, keying both transceivers. Normally-closed contacts 2 and 10 of RY1 and RY2 feed microphone audio into both transceivers. When the microphone is released, default receive mode is restored and RY3 releases.

From default condition, if SX1 is pressed to close contacts 1 and 2, and 4 and 5 (HF listen, VHF xmit), then the following takes place: Vcc is fed through normally-closed contacts 4 and 6 of RY3 through contacts 1 and 2 of SX1, through normally-closed contacts 1 and 9 of RY2, to the coil of RY2. Since Q2 is forward-biased by Vcc through R4, Q2 acts as a closed switch between emitter and collector, providing a ground for RY2 coil. RY2 operates and LED1 is illuminated. Contacts 5 and 9 close on RY2, providing latching voltage for RY2, and RY2 remains operated when SX1 returns to neutral. Closed contacts 7 and 11 of RY2 provide keying ground for the VHF rig and closed contacts 6 and 10 of RY2 feed HF speaker audio into the microphone input of the VHF rig. C2 provides holding voltage for RY2 while contact 9 is travelling from contact 1 to contact 5.

If, at this point, microphone PTT switch is closed, RY3 operates opening contacts 4 and 6 of RY3, thus releasing RY2. Simultaneous local keying of both rigs will follow as described above.

If instead of local microphone PTT keying, SX1 is thrown downward, then the following sequence will happen: Closed contacts 5 and 6 of SX1 remove the forward bias from Q2. This opens the circuit between emitter and collector of Q2, opening the ground circuit of RY2, and RY2 drops open. By process described above for operation of RY2, RY1 now operates and audio is transferred from the VHF speaker output to the HF microphone input. If SX1 were pressed upwards, then contacts 4 and 5 of SX1 would cause O1 to open the ground circuit of RY1, dropping RY1 as RY2 operates. Thus signals may be transferred from rig to rig by the local operator by successive reverse operations of SX1. LED1 and LED3 will show the current status.

EXTRA PANE RELIEVER

I've read KC8DU's article, "Instant Pane Relief" (73, January, 1984), and I believe a few follow-up comments are needed to round out the article.

KC8DU stated that one of his goals was to produce a weathertight and insect-tight assembly. Having worked most of my adult life in the building-material industry, I believe I have spotted an oversight in his reasoning.

Gary described an efficient system for making a weathertight seal as far as it goes. However, the article failed to mention that raising the sash *breaks* the weatherseal between the top and bottom sashes of the window.

To fix this problem, something has to be slid in between the overlapping top and bottom sashes to seal the gap created by separating the sashes. Fiberglass insulation or sponge rubber come to mind to do this. If a storm window is mounted on the prime window, don't forget to seal between those sashes, too. A piece of weatherproof tape placed across the gap should resolve the storm-sash problem.

James C. Burtoft KC3HW
Washington PA

WEST INDIES THANKS

On behalf of the Trinidad and Tobago Amateur Radio Society, I would like to extend our sincere thanks to you and 73 magazine for the books, magazines, and tapes you so generously donated for use in our WCY exhibit. All of the materials arrived in good condition and in time for the exhibition. They were all used in our publications exhibit and helped to illustrate to our visitors what a well-organized and well-supported hobby amateur radio is.

Our exhibit was visited by several thousand persons, many of whom had never even heard of this hobby before. The demonstration radio stations made about 1000 contacts during the weeklong exhibition on the various bands, on SSB, CW, and RTTY. The exercise turned out to be a very successful public relations one and we have added about 40 new associate members as a direct result of it. Many of them have joined the training courses presently being conducted in preparation for this year's amateur-radio exam. The materials you provided have been passed on to those responsible for the training course, and the Morse-code tapes should prove invaluable to our tutors.

Once again, thank you for your support, and I wish you prosperity in 1984.

John L. Webster 9Y4JW
Trinidad, West Indies

And welcome, 9Y4JW, to 73. (See the Trinidad and Tobago column in "73 International.")—Editor.

DX WORLD ON THE C-64

Received the February, 1984, issue and adapted the WB7RLX computer program for the VIC-20 to the Commodore 64 ("Put the DX World on a Screen"). While making the necessary changes, I found a few errors that others might correct when typing:

Line 1059—DATA omitted
Line 1088—OCEN should be OCEAN
Line 1037—SAUDIA ARABIA should be SAUDI ARABIA (line 1125 has the correct spelling, but the two lines would not cross reference).

My compliments to Gene for a very FB program. Mine works beautifully on my C-64. I've changed the screen colors for better contrast and formatted the screen printouts to fit the C-64. Memory required is 12.6K, which is no problem for the Commodore.

If anyone is interested in the C-64 program listing, send me $2.00 plus an BASE; a personalized tape is available for $8.00 if you include your OTH's latitude and longitude.

I love it! Congratulations to WB7RLX and to 73!

Bubba Johnson N4CII
5043 Victoria Avenue
Charleston SC 29406

LIMELIGHT PROBLEMS

I had to chuckle as I read your last editorial regarding the impression by others that your ego is suffering from overindulgence!

We share the problems and benefits of being in the limelight and suffering scrutiny by the public. Too often our images, projected to that public, are far different from real life.

I am often amused by the reaction that I receive when meeting new amateurs here in Indianapolis. There is a sudden "recognition" that flashes across their faces when they realize that the fellow standing in front of them, dressed in cut-offs, a T-shirt that touts the joy of computerized RTTY, and a much abused hat, is really the "star" they see each night on television!

Just making an appearance without a three-piece suit is enough to prove that I am, after all, an OK guy.

I can't count the times that newcomers to my circle of friends have made the comment that I am certainly a lot different in real life than I am on television. What they expect of me I have never been able to nail down, other than the fact that they expect the "image" and not the real person!

To those who offer you the adjective of egotistical, you may use this quote—no charge!

There are those who do,
and those who don't.
Winners achieve their dreams,
The others just . . . won't.

There is certainly a difference: professional desire and inner-drive versus egotism. I believe that your comments over

the months have been composed more as an intended inspirational message for your readers, not mere backslapping. So keep up the good work. If you can get just one or two of those beer-guzzling, television addicts to reconsider their lifestyle, you will have achieved a worthy goal.

For me, each new day has to be filled with some tangible achievement.

I have the unique opportunity of having most of the day for my personal pursuits and then working at the television station in the evenings.

I decided at the first of the year that I was going to do more writing, a pleasurable pursuit that I have neglected for about five years. My free time needed to become money-making time.

It took me a couple of weeks to get organized, and Monday I sat down to research some ideas.

I mailed a letter to your editorial staff at *73* this morning, with four story ideas . . . and found two more this afternoon that look promising.

I had been working on a computer database that provides a listing of beam headings for almost 600 DX, US, and Canadian cities. After six months of hesitation, the program is complete, and another letter will leave here this afternoon addressed to the "Barter 'N' Buy" column. After all, why enjoy the results of the labor without sharing it with others, at a modest price?

In addition, I outlined query letters for the local city magazines for four stories and completed a much-needed giveaway booklet about Indiana weather for the TV station advertising sales team.

By this time, you are probably asking, what's the point?

Tell people to quit dreaming and start doing!

Tell those who doubt your advice to quit questioning and take action. The hardest part of achieving a dream is the fear of failure. Failure can at times be a success in itself; after all, Columbus sailed west to find The East. He failed in his quest, but his failure proved to be more profitable than his original dream!

Cheers, and thanks for listening!

Bob Foster WB7QWG/9
WTTV-TV
Indianapolis IN

HW-8 ON 30 AT 2.1 W

I just completed modifying my Heathkit HW-8 for 30 meters as described by Kerry Holliday WA6BJH in your December, 1983, issue ("A Perfect Match for the HW-8"). I really appreciate the great job Kerry did researching and documenting the modification.

Kerry reported that the 30-meter output of the modified HW-8 was about 1.2 Watts. That seemed low since my HW-8 puts out a full 2 Watts on 40 and 20. The problem turned out to be that the mixer output circuit, L15/C68, does not reach resonance when retuned for 10 MHz. As Kerry describes in step 6, a peak output is noted when the slug is turned almost to the bottom. However, the rf voltage at the test point, the emitter of Q5, was only about 0.6 V while the other bands produced between 1.1 V and 1.5 V. Adding 68 pF in parallel with the existing C68 brought the adjustment range of the slug within reach of 10 MHz, and a peak of about 1.2 V was noted. The rf output rose to 2.1 Watts, virtually the same as on 40 meters.

Incidentally, there is yet another tuned circuit at the output of the driver, Q8. It is a very broad-tuned circuit, however, and no adjustment was provided in the original circuit. Adding more capacitance to bring the resonant peak to 10 MHz only increased the power output by another 0.03 dB; clearly this is not worth the effort!

Again, thanks to Kerry for making the move to 30 so easy!

Ron D'Eau Claire AC8Y
Santa Cruz CA

S-UNITS ON A PINHEAD?

Regarding VE1BZJ's "Thank You for Listening" (*73*, January, 1984), he says, "It certainly adds a few S units when trying to make a QSO through the QRM."

One S unit = 4 to 6 dBs; 2 S units = a couple. A few S units would seem to be at least *12 to 18* dBs. Most S-meters react to peak power, not average power. Can you have BZJ explain how his "expander" increases peak power by a factor of 40 or so?

LXXIII,

A. J. Massa W5VSR
New Orleans LA

I have not actually been able to count the S units at the distant station and could only go by the reports received from the other stations which confirm that my signal is not copyable without the compressor/expander unit turned on.

The statement concerning "a few S units" was figuratively written to convey the point that the signal does get enhanced. Since this is a technical journal and article, I will not waste your time and mine in explaining semantics. It would be more enlightening if the reader experimented with the unit rather than nit-picking the literary style or choice of words of the article.

I am hoping that someone else will build the unit and then perhaps I could judge for myself, and from my end, the exact number of S units that make the difference.—Dennis P. Sladen VE1BZJ.

DR. DIGITAL

Robert Swirsky AF2M
PO Box 122
Cedarhurst NY 11516

THE END OF AMATEUR RADIO

Nothing has prompted more argument among hams than the issue of no-code licenses. Many feel that the code requirement is what keeps the amateur band civilized. It has been argued that the code is the only thing that keeps large numbers of "undesirables" off the amateur bands; without it, we would have chaos.

For some reason, many hams want to make it extremely difficult to obtain a license, and a Morse code requirement fulfills this need nicely. Apparently, those that take this position don't seem to realize that a large ham population is in the best interest of amateur radio. With a large and active body of hams there could be more amateur-radio-related business. Also, other services would be less likely to want a piece of our already-diminished portion of the radio spectrum.

In New York, the FCC now gives ham exams quarterly. This is bound to discourage many people from getting their tickets—something sure to please those who want to restrict the ham population. The way I see it, this could easily cause the amateur-radio service to disappear. As David Byrne said: "Watch out—you might get what you're after."

PACKET RADIO UPDATE

The newest amateur-radio frontier is packet radio. Interest in this mode is steadily growing, although slowly.

A few months ago, I mentioned *SLAPR Protocol*, the St. Louis Area Packet Radio Club's newsletter. The newsletter is no longer being published, and the group is being reorganized. If you are in the St. Louis area and want to get involved in packet radio, their new address is:

- St. Louis Area Packet Radio (SLAPR), c/o Spence Branham KA0IXI, 9926 Lewis and Clark, St. Louis MO 63138.

St. Louis is certainly not the only area where packet radio is thriving. If you live near Tucson, Vancouver, or Menlo Park CA, you will find the following groups useful:

- Tucson Amateur Packet Radio (TAPR), PO Box 22888, Tucson AZ 88734.
- Vancouver Amateur Digital Communications (VADCG), c/o Don Oliver VE7AOG, 818 Rondeau St., Coquitlam BC V3J 5Z3, Canada.
- Pacific Packet Radio Society (PPRS), c/o Hank Magnuski KA6M, 311 Stanford Ave., Menlo Park CA 94025.

NARROWBAND VOICE MODULATION, REVISITED

A few years back, there was much talk about a "new" mode. The American Radio Relay League thought this mode (which in my opinion was just a fancy speech processor) was so important that they devoted a chapter to it in their annual *Handbook*. It never did catch on—I suppose NBVM went the way of quadraphonic sound and other similar technological "breakthroughs."

Now that computers have entered the ham-radio scene, there is a low-cost way to have extremely narrowband voice signals transmitted over the air. What's more, this technique only takes up 170 Hz (!) of bandwidth and is legal in the CW portions of the band.

The way to accomplish this is to use a phoneme speech synthesizer. One such device is the Votrax (500 Stephenson Highway, Troy, Michigan 48084) SC-01 speech-synthesizer IC, which is the basis of a number of speech-synthesizer products (e.g., Votrax Type 'n' Talk). Of course, there is a limitation—one must provide phonetic data for the synthesizer, which can be encoded manually or by computer. There are a number of firms offering text-to-speech programs for microcomputers. These programs take ASCII-encoded English, and by following a set of rules, convert it into the phonetic equivalent.

According to the data sheet for the Votrax SC-01 speech-synthesizer IC, only 70 bits per second of data are required for continuous speech production. If you can prepare what you want to say in advance, this provides a way to have "speech" over extremely narrow bandwidths. It would also provide a way for a visually impaired person to communicate with RTTY.

As I mentioned before, a synthesizer based around SC-01 is programmed using phonemes—the basic speech *sounds* of English. There are 64 phonemes—this means that only 6 bits need to be transmitted for each sound (since any digital code is now legal, within band limitations, there is nothing wrong with using 6-bit "words"). Votrax has symbols associated with each phoneme to make transcription easier. For example, "catalog" would be K AE2 EH3 DT UH3 L AW2 AW2 G, and "empty" would be EH2 EH3 M P T Y. The phoneme symbols that end in a number (EH2, EH3, etc.) are for vowel durations. Phonemes that end in a higher number are for short-duration vowel sounds.

With a bit of practice, one can encode text into phonemes very quickly. A text-to-speech program, such as the one available from MicroMint (917 Midway, Woodmere NY 11598) for the Apple II computer, permits the user to simply type the text in English and let the computer worry about the conversion.

Receiving phoneme-encoded data over the air is a simple process. Just feed the received data, through a buffer, into the speech synthesizer. All the buffering and controlling can be handled easily with a short machine-language program.

Since this "mode" is not a true speech mode, in that one must type one's transmission rather than speak it, it is not suited for conversational communications. An appropriate application would be for radio bulletins and similar one-way communications, where the transmitting station has prepared the message far in advance.

A novel use of this technique might be to have a "subcarrier" voice channel on an FM repeater. By FSKing the repeater's output, a few stations can receive the data using the discriminator output on their FM receivers. Any station using the repeater for conventional voice communications would not be able to notice the small frequency shift on the repeater. Such a subcarrier channel could be used to transmit repeater-status information, club bulletins, weather reports, etc.

Other Speech-Synthesis Techniques

There are a number of speech-synthesis techniques available. Phoneme synthesis, the technique just described, requires a very low data rate (70 bps). Speech quality, however, is not that good. It is understandable but requires a bit of getting used to. (An analogy is the "monkey chatter" of SSB. It sounds strange to people who have never heard SSB before.)

If one wants better speech quality, there are two choices: linear predictive coding and speech digitization. Linear predictive coding (LPC) is what Texas Instruments uses in its "Speak and Spell" talking toys. The technique involves analyzing human speech with computer and breaking it down into sound components. To reproduce these sound data, they are fed into a circuit which, by simulating a human vocal tract, reconstitutes the data into fairly natural sounding speech. Unfortunately, to encode LPC data, time-consuming algorithms are needed. Because of this, the calculations are usually done on mainframe computers or large minicomputers. The encoded data take up more room than phoneme-encoded speech, per second.

Speech digitization is much like using the computer's memory as a tape recorder. Speech is analyzed with an analog-to-digital converter—samples are taken at a rate of 12,000 per second. The data from

the A/D converter are stored in memory. To recreate the sound, the data are played back into a digital-to-analog converter, which is connected to an amplifier. Digitization uses a lot of memory—64 kilobytes can only hold a few *seconds* of speech. The quality, however, is extremely natural sounding.

As you can see, there is no "best" way. Each method has distinct advantages and disadvantages. After working with phoneme synthesizers for a number of years, I tend to favor them. The speech sounds much like one would expect a computer to talk—with a heavy monotone "robot" accent—but considering the memory efficiency that a phoneme synthesizer offers, it is one of the best methods around. It's also the only method that can provide an unlimited vocabulary without extensive preparation.

Phoneme-synthesized speech can be a useful and practical part of a digital communications system. In addition to using it as a narrowband speech technique, it is useful in providing voice output on a RTTY mailbox—stations without RTTY (or mobile stations) can hear what messages are in memory. I will update speech-synthesis technology as more hardware becomes available.

REVIEW

NOVICE GUIDE FROM BASH

Bash has done it again! The all-new *Novice Class Amateur Radio Operator Guide* is now available, and it's a beauty.

No, don't expect the old *Final Exam* book, and don't expect to get the exact answers to every question on the Novice examination, because the *Guide* is not that kind of a book. This time, due perhaps to the new FCC requirements (which are covered by the *Guide*), the format is tutorial, but not pedantic or dull. It is light, easy to read, and *fun*! Virtually everything the prospective Novice will need to know to pass the theory portion of the exam is included.

Let's take a look at some specific features covered by the guide, as well as the mechanical specifications. The book itself has a soft cover with a glossy finish in light blue and black, measures 6" × 9" × ¼", and weighs only a few ounces... exactly the neat, easy-to-carry size that you will find convenient to take with you but not so small that it will be hidden under the piles of things on your desk, table, or bench. Of course, you can't judge a book by its cover, size, or weight... you have to look inside.

Divided into 26 convenient chapters or sections with such titles as "In the Beginning," "The Rules Jewels," "Zip Zap: About Lightning," "Shorties," "So What Do I Say Now?", and the like, the *Guide* tells you neither too much nor too little, but gives you exactly what you need to know to pass the exam.

As many of you know, the FCC has now followed a long-time practice of the FAA with respect to exam questions—that is, the questions that will be asked on examinations are published. That's right, THE questions! So, what's the trick, you ask? Well, the trick is that they choose only one question out of a possible ten or twenty in each of twenty categories covering the subject matter you are supposed to know. Therefore, it doesn't do any good to memorize specific answers to particular questions... you have to know the basic material. Knowing that, you will be able to answer any questions asked, and that's the way it should be. If you read the *Guide* and understand what it teaches and are able to answer the practice questions, then you will be able to take the Novice examination with full confidence that you will pass. You'll be able to answer any question in any category.

The *Guide* provides a catch-all chapter covering many miscellaneous questions that don't fall conveniently into any of the twenty categories. Dick Bash doesn't want you to be caught by any surprise questions.

A very helpful chapter is "So What Do I Say Now?" It covers the Novice version of mike fright—a condition that often occurs when you are making your first half-dozen or so contacts. Let's say you call CQ and suddenly, magically, receive an answer. Maybe it's a more experienced Novice on the other end, and he seems to be sending so fast that even your call (much less his call) is barely recognizable. Before you know it, he has signed over to you... and there's a great dead spot on the band, waiting for your answer. You shake, you sweat, your fingers cramp, and you are scarcely able to send your call. You think, "Oh my gosh, he's waiting for me to say something, and I don't know what to say!" Enter Bash, stage left, to help you out of the dilemma. He gives you sample exchanges, things that are said by both sides in a typical CW exchange. You could almost copy the information verbatim, or you can vary it to suit your own special case by merely changing a word or two here and there. It does get you over those first few critical moments when everything goes blank.

There's much, much more, of course, to the *Guide*, but we don't want to spoil it for you by telling you everything that Dick Bash has up his sleeve. Join in the fun. Give the *Guide* to a son or daughter, a friend, or anyone who might be thinking of taking a Novice exam. Here's a thought: Maybe you will be giving the Novice exam yourself to some potential hams in the club or neighborhood, and you're saddled with teaching the course. If you need a syllabus and text to work from, you could use the Bash book for this purpose, too. In fact, I'll bet that you will find things there that even you have forgotten. Heck, it'll cost you only a well-spent $9.95 (cover price) from *Bash Educational Services, PO Box 2115, San Leandro CA 94577.* Reader Service number 476.

Jim Gray W1XU
73 Staff

THE COMPLETE DXER

Few enjoyments surpass the comfortable pleasure of settling in for an evening's reading of a good book in a snug and cozy environment. For best results, the book should be interesting—which could mean entertainingly written or instructive, preferably both. It should be fact-filled, yet exciting enough to move the reader quickly through the action, never permitting boredom. Most of all, a good book should fascinate the reader and, when possible, place him or her right in the middle of the action. The reader then becomes immersed and is no longer aware of being a reader; instead, he becomes a participant... involved in the story. Time loses meaning, and the story is all. You will find Bob Locher W9KNI's *The Complete DXer* such a book.

Written by an experienced DX chaser, yet clear and simple enough for the beginner, the book tantalizes and teaches at the same time. It recognizes that we all start as beginners, but, more than that, it helps us learn to do things the right way, to avoid the traps and pitfalls waiting to turn a neophyte into a lid, until the goal is in sight—the DX Honor Roll. If you're not on your way to Honor Roll after reading and practicing Bob's brand of DXing magic, then the fault will be yours, not his.

The Complete DXer can be a reference and a guide... a welcome companion to be savored at leisure. Most assuredly, it represents a solid-gold treasure trove of information amassed by a skilled operator during a lifetime of DX chasing. After reading the brief foreward and acknowledgements, you are plunged into Chapter 1, "A Night on the Bands," a foray into the DX jungle of twenty meters on an evening when the band is open. You're there when Bob stalks—and bags—a rare A71 station on Qatar, beating out the rest of the world for this big-game trophy. Then, almost before you can recover your breath, you happen upon the trail of a T55 but don't manage to track him to his lair before he disappears. Bob has managed to decipher his wily habits, however, and you know that next time, Somalia will be yours. This chapter creates the desire to know more, to become a patient and skillful hunter, so you can go out on your own and capture your own DX prizes. You learn that listening and patience and skill mean more than raw power, setting the stage for Chapter 2, "Basic Listening."

The first section of the book deals with basic and intermediate skills and equipment. What to use, where to find it, how to use it... a primer of great and lasting value. The second section of the book builds upon the first, adding refinements of technique, special tricks of the trade, and how to be a sportsman in the truest sense of the word. It teaches you about "Winning, Losing, and Playing the Game." Finally, Bob teaches you his "Last Secret" before turning you loose on the unsuspecting world. In "Conclusion," you are left with a philosophy and a new beginning.

Just the other day when I was talking with Bob about his book, he asked me how I liked it. I gave this answer: "I wish I had written it"—the ultimate accolade... and the truth. *The Complete DXer* is bound to be a smash hit, so you had better get out the checkbook right away and put in your order before they're gone. The price is $10.95 plus $2.00 postage and handling. VISA and Mastercard are accepted. It's available from *Idiom Press, Box 583, Deerfield IL 60015.* Reader service number 477.

Jim Gray W1XU
73 Staff

See List of Advertisers on page 130

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Lane, Reston VA 22090 (VA residents, add 4% tax). BNB089

RECEIVERS—Motorola WWV, $35; Hammarlund HQ-100A, $85; National NC-300, $95; rf signal generator, 80 kc–60 mc, $30; H. P. audio signal generator, $30. K6KZT, 2255 Alexander, Los Osos CA 93402. BNB090

FOR SALE: Kenwood TS-520, $350.00; TR-7850, $260.00. Excellent condition. Cal Swanson W6WYJ, PO Box 1395, Grass Valley CA 95945; (916)-273-4167. BNB091

9.0-MHz SSB CRYSTAL FILTERS, 6-pole, 2.2-kHz bandwidth, 1.85 shape factor, 6- to 60-dB. New, with hardware, specifications: $17.50 postpaid. 4CX250B chimneys, Johnson #124-0111-001, new, boxed: $5.00 postpaid, two for $9.00. Dentron Scout CAP transceiver, new: $300 postpaid. Mosley CM-1 receiver, 80–10, VGC: $60.00 postpaid. Hammarlund SP600 JX-17, GC: $140.00. W. E. Delage, PO Box 231, Kent OH 44240. BNB092

FOR SALE: New Cushcraft R3 halfwave vertical, $215. Tom WA1RTD, 21 Bayberry, Acton MA 01720; (617)-263-2382. BNB093

DX HEADING MAPS for Boston, NYC, Philadelphia, Baltimore, Detroit, Atlanta, Chicago, New Orleans, St. Louis, Dallas, LA. 11″ × 17″, $1.75 pp. 22″ × 34″, $5.95 pp. Specify city. Massey, PO Box 397, Hainesport NJ 08036; (609)-261-2952. BNB094

COMMODORE 64 CW INSTRUCTOR PROGRAM. Generates CW on TV speaker. Random code, keyboard input, or pre-recorded "CW tests." Character speed and spacing set independently. Designed for classes and increasing code speed. $15.00—diskette or cassette (specify). Dennis Olver N7BCU, 20909 S. Ferguson Rd., Oregon City OR 97045. BNB095

STATE-OF-THE-ART, rugged, low-profile antenna systems. Helical designs from 3.5 to 50 MHz. DDRRs from 144 to 450 MHz. Refer to *73* magazine reviews in October and November, 1982. Com-Rad Industries, 25 Imson Street, Buffalo NY 14210; (716)-773-1445. BNB096

ANTI-STATIC DUST COVERS by Cover Craft Corporation. Amateur radio, computers, printers, disk drives, VCRs. New or older models. Over 1,000 designs in stock and over 1,000,000 in use. Call or write for brochure. Birch Hill Sales, PO Box 234, Peterborough NH 03458; (603)-924-7959. BNB097

FREE FREE GIFT. Interested in amateur radio, computers, video? Large SASE pse and mention *73* magazine. Free gift to all. Narwid Electronics, 61 Bellot Road, Ringwood NJ 07456. BNB098

FIND OUT what else you can hear on your general-coverage transceiver or receiver. Complete information on major North American radio-listening clubs. Send 25¢ and SASE. Association of North American Radio Clubs, 1500 Bunbury Drive, Whittier CA 90601. BNB099

THE BIG LIST: a custom-produced computer printout on bond paper, with letter-quality print, showing prefixes, locations, beam heading, and distance to almost 600 DX, US, and Canadian locations. All produced for your location! No more guessing where a country or US city is located! Listing is alphabetical according to DX prefix and also by city. Please provide your exact latitude and longitude with order, or we can use data based on the closest airport. This printout is over 11 feet in length! $15.95 ($17.95 with deluxe binder). The Big List, 10126 Catalina Drive, Indianapolis IN 46236. BNB100

MAGICOM RF SPEECH PROCESSORS—Add 6 dB of average output with genuine rf clipping in your transmitter's i-f stage. Custom engineered for Kenwood TS-120, TS-130, TS-430, TS-520, TS-530, TS-820; Drake T-4X, TR-7; Yaesu FT-102. Excellent speech quality, simple installation, affordable prices! SASE for data and cost. Magicom, PO Box 6552A, Bellevue WA 98007. BNB101

SULTRONICS offers TET antenna systems with factory backup and parts. Call or write for our complete catalog with full descriptions and specs on the full line of TET antennas—the best! For fast and friendly service as usual, contact Dan WD8IDZ or Nina N8ANU at Sultronics Amateur Radio, 15 Sexton Drive, Xenia OH 45385; (513)-376-2700. BNB102

SULTRONICS has Hy-Gain at the lowest prices anywhere!! TH7DX—$369.96; TH5MK2S—$303.95; new Explorer-14—only $264.95!! Limited to stock on hand, so call or write now!! Sultronics Amateur Radio, 15 Sexton Drive, Xenia OH 45385; (513)-376-2700. BNB103

WANTED: older tube-type amateur or general-coverage receiver in good condition. Send description and asking price. Steven D. Jones N2AMY, Box 6585, Ithaca NY 14851. BNB104

AWARDS

DAVY CROCKETT

On April 28, 1984, the Bryan Amateur Radio Club will run a special-event station in the Crockett National Forest to commemorate the contributions of Davy Crockett to the fight for Texas independence. The club will operate W5RAS from 1800 UTC Saturday to 0600 UTC Sunday on 80–2 meters on the phone bands. Certificate for $1 and an SASE to QSL manager KA5OIT, 2203 Franklin, Bryan TX 77801.

TATER DAY

The Marshall County ARA will be operating a special-event station from 1800Z April 1 to 2400Z April 2 to commemorate the 141st Tater Day Celebration. Operation will be on CW, 7120. Operation 20 kHz up from lower 40-15-meter General phone-band edges and 146.55 simplex. Certificate will be given. Send QSL and large SASE to WG4U, Route 2, Benton KY 42025.

X-WARN

X-WARN (Xenia Weather Amateur Radio Net) announces the planned operation of special-event radio station WB8QZZ on March 31 and April 1, 1984. Our operation commemorates the rebuilding of the Xenia community on the 10th anniversary of the killer tornado of April 3, 1974. This triple twister damaged half of the homes and businesses in a city of 25,000 and killed 33 persons. Amateur radio contributed immensely with emergency communications in the hours and days after the storm. X-WARN was organized subsequent to the tornado as a means of providing prompt local weather observations during National Weather Service alerts.

The special event will operate two HF transceivers from 1500 to 0300 UTC on Saturday and 1500 to 2300 UTC on Sunday. Frequencies will be SSB: 7.275, 14.275, and 21.375 (± 10 kHz). We will also have a third rig on 2-meter FM: 146.52 simplex or the X-WARN repeater 147.165/765. Please send QSL and SASE to N8CYS (per *Callbook*) for special commemorative QSL.

ARBOR DAY

A special-events station will be operating from the Nebraska State Arbor Lodge, former home of J. Sterling Morton (founder of Arbor Day), in Nebraska City, Nebraska, during the annual Arbor Day celebration. This station, in addition to other club-member stations, will be operating in the General portion of the phone and CW bands on 80 through 10 meters from 2400 UTC April 27 to 0600 UTC April 29. In addition, other club-member stations will be operating from their own QTHs from 2400 hours UTC April 23 to 0600 hours UTC April 29. All amateurs contacting this station, K0TIK, or any other club-member stations during these times will be eligible to receive an Arbor Day commemorative certificate from the Nebraska City Amateur Radio Club. Please send one dollar and a business-size self-addressed envelope to John K. Nihart KA0OKI, 7731 Holdredge, Lincoln NE 68505.

HAM HELP

I have recently purchased a Radio Shack TRS-80 model 100 and would like to know if there is any ham software available for it commercially. I am particularly interested in any CW send/receive and RTTY software and would appreciate having the names of any companies that might have such systems. Information about software for other computers that run Basic would even be helpful, as I think that I could adapt it for the model 100.

David C. Eanes N4AZI
4866 Drusilla Lane
Baton Rouge LA 70809

I want someone to have a sked with me to increase my CW speed. Must use keyboard and start at 25 wpm. For more info, call (304)-983-2157.

Roger Vankirk KX8Y
Rt. 2, Box 388X
Morgantown WV 26505

I would like to hear from anyone who has modifications to put the Ten-Tec Omni on 10-meter FM.

Stephen J. O'Malley N2CLE
140-26 Poplar Ave.
Flushing NY 11355

I need a service manual or schematic or copy of same for a Yaesu FM FT-202R handie-talkie. Also need crystals for 2 meters or charger.

Cyril T. Wolff WA7LOV
S. 5507 Marshall Road
Spokane WA 99204

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 6

TV-10 to see if I've guessed right about hand TV sets.

Speaking of Sinclair, the absence of Timex from The Winter Consumer Electronics Show was most obvious. Last year they made a big fuss about introducing the Sinclair Spectrum, only to change their minds when the Model 1000 was bombed out by the VIC-20.

Timex, which has been quite stand-offish to firms interested in supporting their computers with a magazine or software, is paying the piper for this bit of folly—to the tune of hundreds of millions of dollars. They fired the people who engineered the disaster, but it is probably far too late now to recoup. Texas Instruments pulled the same stunt, with even greater losses.

Despite the dead and badly wounded microcomputer manufacturers, the industry itself is still growing at about the same 250% per year rate. It's just that Timex, Texas Instruments, Atari, and so on are not getting big chunks of it. Radio Shack has been holding on. Apple is at the crossroads, gambling everything on their Macintosh.

All of this has been a bonanza for hams who early on got interested in computers and who have jumped aboard the industry. The micro industry is rife with hams, as I see when I'm stopped by hundreds of old *73* subscribers at the Comdex and CES shows. Many claim that it was my editorials and articles in *73* that got 'em into computers—and rich.

The next big field, as I've written before, is going to be communications. Some ham is going to design a simple radio system to automatically send messages and parlay that into a $500 message communications system for private aircraft which will eliminate the need for voice communications between pilots and towers. This chap could easily get extremely wealthy. The nice thing about this is that everything needed for the system has already been invented. All it takes is an experimenter to put it together, test it, and find a venture capitalist to back him. Eureka! Millions. And, you know, a kid of 15 could do it.

Let's get some work done and get some articles in *73* to spur more experimenting. It's possible for hams to again get up front in developments and regain some of the prestige we once had. The FCC is off our backs now, so we can experiment.

COME FLY WITH ME

Are you looking for some small electronic or ham product from Asia which you might import and sell by mail order? Quite a few big businesses have been built in the last few years doing this—JS&A, the Sharper Image, Markline, and so forth. The best time to see the smaller Asian firms is in October during a series of consumer electronics shows.

These shows are set up so you can attend four of them in the four key Asian electronics manufacturing countries—Japan, Korea, Taiwan, and Hong Kong—one after the other, all in two weeks. This could be two weeks which might change your life—if you have some entrepreneurial spirit.

Commerce Tours has been arranging trips to Asia which bring people to these four shows for several years now. I've been going on them for five years and have been very impressed by the fine hotels, the number of special events and meals, and the planning of every detail by the firm. And the price—I don't see how they provide so much so reasonably.

I've encouraged hams to accompany me on these trips in the past and every one of them has had a great time—often meeting with Tim Chen BV2A in Taipei, shopping for electronic equipment in Hong Kong at incredibly low prices (I have my shopping list already made out), loading up on dirt-cheap Apple boards, and so on.

The tour is timed to get you to all four of the shows, complete with all transportation. This is about the only real way for you to meet and talk business with the hundreds upon hundreds of small manufacturers in Asia. This is where you may find some brand-new products which haven't yet migrated to the US—or perhaps some lower-cost versions of popular items.

The whole trip costs $2,000. That includes all transportation, first-class hotels, lavish breakfasts, a number of other meals, show admissions, several optional shopping tours, and so on. Bob Chang and his family, who organize electronics and computer tours, are at home in Asia and thus have everything under superb control.

We've always had a group of hams on these tours, which usually run from 150 to 250 in number. This year we're going to be joined by a group of Australian amateurs, so we should have even more fun. And wait until you see the price of Japanese ham rigs in Hong Kong!

The trip leaves California October 2 and returns October 16. You can leave from either San Francisco or Los Angeles. Further, if you want to take some extra time at the end of the tour, you can come back for a small additional fare any number of ways. I've made low-cost side trips to China, Macao, down to Borneo, stopping off at Sarawak, Brunei, Sabah, and Manila, or via Bangkok and Singapore, Hawaii, and so on. Why not add a couple unusual shopping stops and visit some rare DX hams? They'll love it and so will you.

Please let me know as soon as you can if you are planning to join me this year. But watch out, I'll be looking for things to import, too. Drop me a line for details: Wayne Green—Asia!, *73*, Peterborough NH 03458.

Operating? Japan is still tough, but we might be able to make it in Korea if you ask ahead. Taiwan is still tight. Hong Kong is a song—just bring a copy of your license. Yep, they have two-meter repeaters there.

73 INTERNATIONAL

from page 96

DX from 7:00 am to 9:00 am at first, and then later perhaps for another hour. Later, it is expected that there will be a new repeater for the 10m-FM band (which I understand has already been purchased) so that daily DX contacts can be made continuously, especially with friends in the United States. Question: Would you be able to recommend a frequency that we could set our repeater on for 10m-FM use? If so, please contact me immediately with the information and I will have it relayed to the proper authorities. We need to have an idea of a frequency that would be preferred to our fellow hams in the USA as well.

REPEATERS IN MEXICO CITY

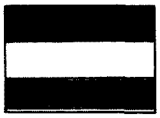
As you may know, Mexico City is said to be the largest city in the world (population-wise). Some have said that there are more than 16 million people (taking into account the metropolitan area as well as the surrounding areas that are practically part of the city itself). Well, if you come to visit us someday, you'll know what I mean! Better freeways and overpasses are constantly being constructed, adapted, and changed. To illustrate the point, I was driving along with my father-in-law one day (he's a native from Mexico City). Well, we got lost for about 2½ hours! So you can imagine what it's like, even when you think you know what you're doing! (Unfortunately we did not have our 2-meter equipment with us at the time. Last time I'll make that mistake!)

So, where you have a big city, you have a larger ham population as well, and even a few repeaters and radio clubs who own them. (See Fig. 1 for a list of clubs and their repeaters in Mexico City.) Of course, you have to be authorized by the Mexican Communications Department in order to use your equipment here in Mexico. Be sure your papers are in order before vacation time unless you just want to go "all ears." The local operators here are very friendly and sociable and enjoy having foreign visitors drop in. And it's nice also if they have personally been in contact (QSO) with you beforehand, which makes it all that more interesting.

With most radio clubs that I have known in different parts of the country, it's a custom to get a few of the members together for a cup of coffee and maybe a small meal (tacos anyone?) whenever foreign colleagues show up. It's a real social occasion and sometimes very interesting. At one celebration that the Satellite Radio Club sponsored, Marciano XE1GIY flew his jet overhead a couple of times as we made contact on two meters with him before his departure. I'm sure you'd enjoy good-old Mexican hospitality! And your friends would enjoy sharing it with you!

ID	Frequency	Radio Club
XE1RPV	146.31/.91	Aztec Radio Club
XE1ERA	146.34/.94	Aztec Radio Club
XE1RUL	147.72/.12	La Salle University Radio Club
XE1RSC	147.63/.03	Satellite Radio Club
XE1TLA	147.84/.24	Latin American Tower Radio Club
XE1VHF	146.28/.88	VHF Association
XE1YG	146.16/.76	VHF Association
XE1UHF	449.100/444.100	VHF Association

Fig. 1. Repeaters in Mexico City.



THE NETHERLANDS

H. J. G. Meerman, Jr. PD0DDV
Zandvoorterweg 33
2111 GR Aerdenhout
The Netherlands

THE VRZA

This month I would like to write something about the VRZA (the Vereniging van Radio Zendamateurs). As you may already know, there are three amateur-radio societies in Holland and one of them is the VRZA. Translated into English, these letters stand for Union of Ham Radio Amateurs.

The VRZA was founded in 1951, about 33 years ago. The number of members is enormous for a small country like ours. As far as I know, they have 4500 members, but by the time you read this the number will no doubt be much higher. Well, as you see, amateur radio is a fast-growing style of life in Holland.

The VRZA has also its own magazine which is sent out to members once a week. It is full of news and technical articles concerning ham radio. Many of the build-it-yourself projects that are published in this magazine (called *CQ-PA*) are from VRZA members. Often the VRZA has circuit boards available for these build-it-yourself projects, for cost price. Another service is the selling of hard-to-come-by parts, such as special coils, filters, transistors, etc.

PA0VRZ/A is the callsign of the VRZA club station. This station is on the air every Saturday morning on the 80- and 2-meter bands with news on phone, CW, and RTTY. Also a code course is given.

AWARDS

Although the VRZA has a large number of awards, there is one that deserves special attention, namely the WAP Award (Worked All Provinces). This award is available to hams who have worked all Dutch provinces or to SWLs who have received amateur stations from all provinces. For those who wish to know more about VRZA awards or about the VRZA itself, I'll give you the address: VRZA, Postbus 61420, 2506 Ak Den Haag, The Netherlands.

Don't forget some IRCs to cover the expense of answering and mailing your letter.

DUTCH QRP ACTIVITY

For the QRP enthusiast in Belgium, Holland, and Luxembourg, we have the Benelux QRP club (BQC). This club is especially for amateurs who like to work with low power. An output of 5 Watts for CW and 13.4 Watts for SSB is the maximum power that can be considered as QRP.

The Benelux QRP club gives advice to its members, organizes QRP contests, and has its own low-power network every Saturday morning at 0930 UTC. Members of the club use the international QRP frequencies: 3,560, 3,690, 7,030, 21,060, 21,285, 28,060, and 28,885 MHz. The BQC is also a member of the World QRP Federation. The address of the BQC is: PO Box 15, 2100 Heemstede, The Netherlands.

NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

As this column is being prepared during December, while our northern-hemisphere confreres are celebrating the Christmas festive season in true form with the traditional winter scenes and trappings, we here down under celebrate under somewhat different conditions. There is no snow, and a large part of the populace heads for beach and lakeside resorts to celebrate Christmas in temperatures of 20° C plus, depending upon the location.

But no matter where we are in the world, as far as seasons are concerned, Christmas will always consist of a Christmas tree trimmed with lights and artificial snow, Santa Claus in his heavy red uniform, complete with white beard and hat (always a very hot job), with his sleigh full of presents for all, and a huge dinner on Christmas day of roast turkey, chicken, pork, or lamb (depending upon choice) plus vegetables, followed by Christmas plum pudding and complemented with the usual beverages.

Although it is somewhat out of season for us here in ZL-land to have a huge hot midday meal when the weather would indicate a cold-cuts-and-salad-type meal, followed by cold sweets, most New Zealand families still stick to the traditional dinner and celebrations, following the traditions of our forebears who, in most cases, came from the northern hemisphere. Christmas in ZL is also the main holiday season, most of the commercial concerns closing from Christmas Eve until about January 10th for their annual holiday, with the exception of small staffs to handle urgent business. The retail section of the business community goes on as usual, although almost everything closes down completely on Christmas Day.

BITS 'N' PIECES

Recently NZART obtained permission for radio amateurs to play chess against other radio amateurs on the air. This is another step in the expanding international group: Chess Amateur Radio International (CARI), whose headquarters are at PO Box 682, Cologne NJ 08213, USA. This group is encouraging participation in on-air chess games between radio amateurs, and the group has interested members from W, VE, HH, I, OH, VK, ZL, DA, KH6, and KL7. Write to the address stated for further information.

The first CARI Oceania tournament was held in August, 1983, with stations from KH6, VK, and ZL participating. Now in its second year, CARI has 160 members, has regular weekly and daily schedules, and a special "contact wheel" for finding chess QSOs. A rating system has been established and regional tournament directors appointed in seven areas worldwide. The founder and first president of CARI is Vince Luciani K2VJ. It is interesting to note that amateurs in New Zealand were playing chess over the air prior to 1932, and an article in *Break-In*, the NZART official journal, in August, 1932, covered the activity. In the intervening years, the activity went into recess until it was revived by the formation of CARI.

Morse code is alive and well—so goes a report from ZL4FC in *Break-In* on the use of Morse code in commercial communications, particularly marine communications, here in ZL. There are still professional brass pounders here, employed by the New Zealand Post Office at three of the four Marine Coast Stations operated by the NZPO, and many of them are amateur-radio operators, too. Morse is the main mode of long-distance high-frequency communication and still proves reliable when all else fails.

Morse is the main mode of communications at Awarua Radio, situated at the southern end of the South Island and, to a lesser extent, at Auckland and Wellington Radio Stations. The New Zealand Post Office still trains operators at their school in Wellington, where the trainees have to attain proficiency in the code at 25 wpm both sending and receiving, over a 10-minute test period, with only two errors allowed. This high standard of proficiency in Morse has been unchanged since the days of the telegraph landline circuits, when the Post Office employed hundreds of Morse operators on circuits throughout the country.

Morse is on the decline in the commercial communications area, with the inroads made into Morse traffic by Telex (SITOR) and satellite traffic, but the biggest impact on marine traffic has been the decline in the number of ships now in world fleets. Two vessels now do the job of 10 ships since the concept of carrying cargo in containers was introduced, and this has had more impact on Morse traffic than anything else. But as the writer of the *Break-In* article says, "Morse is alive and well, and the skills of the brain and fingers of the Morse operator still play a part in modern technology."

The historic space-shuttle flight of Owen Garriott W5LFL during the latter part of November was followed with great interest in ZL, but as far as can be ascertained to the date of this writing, no ZL was able to record a QSO with W5LFL, and I don't think any ZL was successful in copying him, either. But I am awaiting confirmation of this from the VHF and satellite experts elsewhere in the country.

An extract from a lecture sponsored by the Auckland University Foundation, given by the distinguished space scientist and ZL, Sir William Pickering, congratulated New Zealand communications engineers on the development of a hand-held radiometer, produced as a joint venture by the government Department of Scientific and Industrial Research and an Auckland electronics firm, Delphi Industries. It proved that local New Zealand industry and engineers are capable of competing with the world's best. The newly developed radiometer is to be tested on a forthcoming space-shuttle flight.

In a recent issue of one of the popular US amateur magazines, I noted in the DX column that some concern was expressed by a prominent DXer about the Kermadec Islands and the possibility of them being the likely subject of a DXpedition in the

near future. I was somewhat dismayed to read this report when there is at present a resident amateur on Raoul Island at the weather station who was active for short periods during the latter part of 1983 and who intends to be more active during 1984. He is Warwick ZL3AFH/ZL8AFH (new callsign of the Kermadecs), and according to my information, after the settling-in period just before Christmas, he was to get antennas up and be as active as his duties permit on most bands during 1984. *(Editor's note: See the Australia column, this issue.)*

The Rose City NZART Conference will be held in Palmerston North from June 1 to 4, 1984. Details of the conference venue are as follows: The Rose City Conference will be held at the Awapuni Racecourse and will commence with a reception, registration, and a wine and cheese evening on Friday night. The formal business of the NZART will be conducted on Saturday, followed by the Grand Dinner and Dance in the evening. On Sunday, the AREC, OTC, WARO, and other meetings will take place, as well as other activities including the transmitter hunt (fox hunt) and a mobile rally. An informal social and prize-giving session will conclude Sunday's activities. Enquiries for accommodation, etc., to PO Box 1718, Palmerston North, as soon as possible.

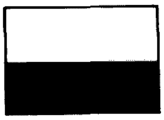
NEZCHEQ 83, the second biannual North American/New Zealand County Hunters Eyeball QSO Party mentioned in a previous column was a great success. It was held over the US Labor Day weekend at Shelton, 50 miles west of Seattle, Washington, and finished with a banquet at the Alderbrook Resort Hotel on Sunday night. In all, 17 ZL hams and YLs were amongst the 40 US and ZLs at the QSO Party. In the US group were some from as far away as Oklahoma and Alaska. The weekend activities were mainly social with a little "hamming" at the official County Hunters station and plenty of eyeballing with those so often heard and worked on 10 and 15 meters. The festivities were continuous fun from dswn until almost dawn.

It is reported that one station which worked the Convention station said he believed that the whole gathering was in the state of intoxication, but he was informed that no, the station was in the State of Washington. At the banquet, after the obligatory short speeches, the fun climaxed with awards presentations. Special awards were made to Jsy W7KBC, the first-ever North American County Hunters W7KBC Award, in honor of Jay being the first North American amateur to work all 112 New Zealand counties for the NZART Counties Award.

A special gift was made by the attending ZLs to the host, Tom KB7MT, and all other members present exchanged souvenirs and gifts. The next convention (NEZCHEQ 85) will be in Houston, Texas, and most of the ZLs and North Americans present at the 1983 convention plan to be present again.

Another member of the Old Timers Club has joined that elite band of 60-year Jubilee Certificate holders. He is Frank Bell ZL4AA, the first licensed amateur in ZL, who received his license in January, 1923. Frank is a life member of the OTC and is its Immediate Past Patron. 50-year certificates have also been issued to J. (Rollo) Schofield ZL1JK, Arthur Allen ZL1JQ, and Arthur Lyes ZL3JD.

Silent Keys recorded recently were John Palmer ZL1KV, Norman Walding ZL2GZ, Sam Hopkins ZL2AGX, Stan French ZL2JB, and Eric Pool ZL2MZ.



POLAND

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SCOUT RADIO AMATEURS

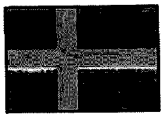
Scout radio club activity was suspended after martial law was declared in Poland, but even before a reinstatement of individual ham activity, 30 Scout radio clubs got licenses. Two contests, "Scout's Wave" and "Silesia-Polish Scouts' Association," were organized this year. Among individual stations, the other contest was won by SP9EMI. The best club station was SP7KTE, and the best monitor was SP7-8801/K. Regularly on Mondays and Fridays at 1700 GMT on 3700 kHz, the so-called Scouts' Circles take place. An exchange of training radio telegrams on 3550 kHz CW on Mondays, Wednesdays, Thursdays, and Saturdays, and on 3700 kHz SSB on Tuesdays and Fridays begins, always at 1600 GMT.

Scout radio stations working on 3.5 MHz revived the activity of Polish hams this summer. Many young hams in Scout uniforms practiced their skills in camps competing for the certificate, "Scout's Camps." One of these camps was organized by the Communication Committee of the Polish Scouts Association (PSA) together with the Konin Troop of PSA in Mikorzyn, near Konin. 15 Scouts and 2 instructors from the Korin, Leszno, and Poznan troops were to take part in a school of Scout communication and amateur-radio location. Finally, 49 participants for the communications course and 10 candidates for referees of amateur-radio location gathered in this beautiful spot.

Participants at the Mikorzyn camp were taught all kinds of Scout walking, telephone, and radio communication. Shortwave instructions, treated at this camp as an introduction, will be continued at a winter camp in Kiekrz. Instructors were confronted with the problem of teaching communications courses to budding novices of the communication art, 13 to 18 years old. In spite of nearly 10 compulsory lessons daily, these Scouts elected to have supplementary sessions. Radio station SP3ZCU/3 was establishing contacts during the time of the camp. Films on principles of electrical engineering and electronics rounded out theoretical and practical courses.

A final session took place on August 8th. Candidates for referees of amateur-radio location prepared and carried out the final contest on 3.5 MHz and 144 MHz by themselves. Other participants at the school acted as competitors and proved their skills before the coming Radiolocation Contest of Poland. Skilled staff and the lovely neighborhood of Slesinskie Lake contributed to a nice atmosphere at the camp. Many Polish and foreign visitors (these last from Germany and Bulgaria) went and saw their friends.

Some months ago I mentioned the SPDX Contest 1983 that was doubtful then. Among individual stations taking part in this contest were SP7AW, leading with 809 points and 232 certificates, SP9DH (573 and 138), and SP9ADU (557 and 182). The best club station of the contest was SP7KTE (660 and 201), and among monitoring stations, SP9-3354-KA (132 and 40).



SWEDEN

Rune Wande SMØCOP
Frejavagen 10
S-155 00 Nykvarn
Sweden

SSA ANNUAL MEETING

The Swedish amateur radio league, SSA, is holding its annual membership meeting this year in the city of Falun in the province of Dalarna (Dalecarlia). The meeting is taking place during the weekend of April 14-15. The hosting Falu Radioclub is celebrating its 60th anniversary.

The province of Dalarna has played an important role in Swedish history. The farmers were willing to fight for their freedom and, among other kings, Gustav Wasa managed to get them to uprise against the Danish intruders in 1521. To celebrate this, every year over 10,000 skiers compete in the world's oldest and largest cross-country ski race from Salen to Mora, a distance of close to 90 kilometers (65 miles). Besides the regular meeting on Sunday, there will be exhibitions, speakers, women's activities, and the Saturday night banquet. Dalarna is in the SM4 call area.

PACKET RADIO

The Softnet User Group at the University of Linkoping is inviting everybody interested in experimental packet radio for both ground and satellite systems to EXPRAN 84, this year's Softnet workshop.

The Experimental Packet Radio Network Symposium is taking place in the city of Linkoping (SM5 call area) on May 26 and 27, 1984. Planned subjects for seminars are packet radio, network control and routing, distributed processing, proposals for standards, and Softnet. The Swedish high-technology aeroplane and computer industry, SAAB, is located in Linkoping.

TELEPHONE INTERFERENCE

Televerket is the National Swedish Telecommunications Administration and has the monopoly for telephone communications distribution in Sweden as well as being the licensing authority for radio communications. Televerket is also a manufacturer of telecommunications equipment as wall as the approving authority for equipment manufactured by others that is designed to be connected to their systems.

Only a couple of years ago the telephone system in Sweden allowed modem push-button telephones. These have, of course, turned out to become very popular and are replacing the old rotary-dial phones. Televerket manufactures a push-button phone called Diavox, about the only one, for the time being, approved for their own system, i.e., the only system in Sweden.

These new telephones made by Televerket and spreading very rapidly are of great concern to us active radio amateurs. The Diavox telephone is extremely susceptible to rf. Televerket is now very well aware of this fact and is trying to take care of problems when interference complaints are filed. Before then, however, the innocent ham operator has had another confrontation with his neighbors. Everyone that has had such an experience can tell that there are more pleasant meetings than these. I had one fellow from Televerket working on my Diavox telephone for 2½ hours without complete success. The interference was there either when operating on 14 MHz or 28 MHz. Considering the low sunspot cycle we are in now, I chose to have the interference on 28 MHz!

It is very unfortunate to have this unnecessary interference problem, especially now with the growing popularity of video recorders that may become our worst RFI problem to date. The video recorders seem to be more susceptible to rf than any of the other home electronic equipment we have fought so far.

WINTER CONDITIONS

In this arctic region, aurora borealis is very common during the winter season. This dark time of the year favors the low-band DXers propagationwise. It is even possible to work the 160-meter band 24 hours a day during several weeks around Christmas.

As a rule, you can say that "the closer to the equator you are, the better short-wave propagation you have." Being a DXer, living this far north as we Scandinavians do is sometimes tough. About the only time we have a more favorable situation than the south Europeans is when propagation to the Pacific is over the North Pole. This is common during early morning local time in the summer.

During the deep winter season, our most stable DX band, 20 meters, closes down completely in the evening around 1800 hours and opens up when it is time to leave for work in the morning. If you do not like the very noisy low bands, there is not much hamming to do these dark winter nights. It is hard for non-Europeans to imagine how crowded the low bands are here at night. The broadcast and other commercial intruders on the 40-meter band that you may be bothered with are much stronger here than anywhere else!

RECEIVER SHORTCOMINGS

In the late 60s and early 70s, many hams here lost interest in the 40-meter band. I think this was primarily because of the cross-modulation problems the new transistorized receivers were impaired by. One major importer of Japanese ham equipment once told me that he could not convince the manufacturer how severe this problem was here is Europe until they got to experience this on the spot. The receivers certainly have improved in this respect, but the intruders are still pounding their hundreds of kilowatts within the ham-exclusive 100 kHz of the 40-meter band.

80 METERS SHARED

The 80-meter band is shared with other services in Region 1. In the evening it is hard to find a spot where the S-meter drops below the S9 level. With good antennas, sharp filters, and a great deal of stamina, some avid DXers manage to break through the noise level and to work distant stations even on eighty.

AURORA AND TWENTY METERS

When there is aurora, which happens quite often, the 2-meter buffs are happy. However, it also favors very short skip QSOs on 20 meters. Normally, you cannot work within Scandinavia on twenty, but in aurora conditions LA, SM, OH, and UA1 are workable. Very seldom we can reach as far south as OZ Denmark. In aurora a totally dead band suddenly becomes alive.

STRANGE OPENINGS FROM LAPLAND

I grew up in Lapland, northern Sweden, just north of the Arctic Circle, which is the call area SM2. My QTH was located further north than Fairbanks in Alaska, which might be of some reference help to

you. In the wintertime from up there I usually could work the west coast of the North American continent at night. VE8, VE7, KL7, W7, and all the way down to W6 was (and, of course, still is) workable. The signals crossing the North Pole are characterized by a very rapid flutter. In those openings you may not hear too many stations from here. The reason is simple. The population is small in those arctic areas of Sweden, Norway, Finland, and the Soviet Union.

Now summer is quickly approaching. The conditions are changing. With the midnight sun and daylight 24 hours a day, the change is not entirely to the better, but it surely is different!

John L. Webster 9Y4JW/8P6KX.

TRINIDAD AND TOBAGO

John L. Webster 9Y4JW
c/o Department of Soil Science
University of the West Indies
St. Augustine
Trinidad
West Indies

The Trinidad and Tobago Amateur Radio Society (TTARS), formed in 1951 and incorporated by an Act of Parliament 30 years later in 1981, has a membership of 140, from a total population of 1.2 million persons on the two islands. There are also about 100 associate members in the society. Only about fifty percent of the 140 hams are active, some on VHF, some on HF, and others on both.

The TTARS has been a member of the IARU for about 10 years and is an affiliate of the Radio Society of Great Britain (RSGB).

The British City and Guilds Radio Amateur's Examination (RAE) is the certification required by the Government of Trinidad and Tobago, along with Morse code proficiency at 13 wpm, for the issue of a 9Y license. The code test is administered by the Director of Telecommunications after the successful completion of the RAE exam. In 1982, the TTARS stepped up its training program in an effort to encourage more persons to become hams, and weekly classes are conducted to prepare its associate members for both.

Unfortunately, the exam is offered only once a year as it is an external examination. It is written in May and the results are not known until the end of August or about three months later! The successful candidate then applies for the code test.

The 1982/83 training classes were conducted at two centers, one in the north of the island, in the captial city of Port of-Spain, and the other in the south, in San Fernando, the industrial center. There is now a third center for the 1983/84 classes, in the center of the island, at Chaguanas.

At each center, classes are conducted twice weekly, one session for theory and the other for CW.

The TTARS normally charges a small fee, the main objective being to encourage those who started the course to complete it. Any funds raised in this way are available to assist in acquiring equipment and materials needed in running the course. However, as 1983 was World Communications Year, the TTARS decided on an "open-house" policy for the 1983/84 training classes and there is no charge for the course this time.

Good results have been achieved by the TTARS in the RAE examinations. In the 1982/83 examination, 90 percent of the candidates prepared by the TTARS were successful. In actual numbers this means that there are 22 potential new 9Y hams if they complete their code tests. One of the successful candidates, Mark Massiah, obtained a double distinction in the exam and provided a very good showing in his code test. Mark, who has been assigned the callsign 9Y4M, favors CW operating and should be providing a new country to many of you still needing 9Y on this mode.

The TTARS does not have a clubhouse but is allowed the use of Boy Scout Headquarters in Cascade, north Trinidad. Meetings are held on the first Monday of each month at 7:30 pm. The meetings alternate between north and south Trinidad, those in the south being held at Presentation College in San Fernando. The Annual General Meeting, at which new officers are elected, is always held in north Trinidad during the month of March.

In my next column I will present part I of a two-part review of the activities of the TTARS during 1983, World Communications Year.

See List of Advertisers on page 130

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Avantek transistors, amplifiers, oscillators, and LNAs. Coaxial cable and connectors. Blonder Tongue dealer with Microwave laboratory. Applied Specialties, Inc., 10101G Bacon Drive, Beltsville MD 20705. Wash. 595-5393, Balt. 792-2211. 7:30 am to 6:00 pm, Monday thru Friday.

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Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the May '84 issue must be in our hands by March 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

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J. H. Nelson
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EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14	14	14	7B	7B	14	21	21A	21A	21A	21
AUSTRALIA	21A	14	14	7B	7B	7B	7B	14B	14B	14	21	21A
CANAL ZONE	14A	14	7A	7	7	7	14A	21	21	21A	21A	21
ENGLAND	7	7	7	7	7	7	14	14A	14A	21	14	14
HAWAII	21	14	7B	7B	7B	7	7	7	14	14A	21	21A
INDIA	14	7B	7B	7B	7B	7B	14	14	14	14	14	14
JAPAN	14A	14	7B	7B	7B	7B	7	7	7	14	14	14A
MEXICO	21	14	7A	7	7	7	7	14	14A	21	21A	21
PHILIPPINES	14A	14	7B	7B	7B	7B	7B	14B	14	14	14	14A
PUERTO RICO	14A	14	7	7	7	7	14	14A	21	21A	21	21
SOUTH AFRICA	14	7B	7	7B	7B	14	21	21	21A	21A	21	14A
U. S. S. R.	7B	7	7	7	7	7B	14	14	14A	14	14	7B
WEST COAST	21	14A	7A	7	7	7	7	14	14A	21	21A	21A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	14	14	14	14A
ARGENTINA	21	14	14	14	7B	7B	14	21	21A	21A	21A	21
AUSTRALIA	21A	14A	14	7B	7B	7B	7B	14B	14B	14	21	21A
CANAL ZONE	21	14	7A	7	7	7	14	14A	21	21A	21A	21A
ENGLAND	7B	7	7	7	7	7B	14B	14	14A	14A	14	14
HAWAII	21A	21	14	7	7	7	7	7	14	14A	21	21A
INDIA	14	14	7B	7B	7B	7B	7B	14B	14	14	14	14
JAPAN	14A	14	14B	7B	7B	7B	7	7	7	14	14	14A
MEXICO	14A	14	7	7	7	7	7	14	14	14	21	21
PHILIPPINES	14A	14	14B	7B	7B	7B	7B	7	14	14	14	14A
PUERTO RICO	21	14	14	7	7	7	7A	14A	21	21A	21	21
SOUTH AFRICA	14	7B	7	7B	7B	7B	14	21	21	21A	21	14A
U. S. S. R.	7B	7	7	7	7	7B	7B	14	14A	14	14	7B

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	14	7	7	7	7	14	14	14	14A
ARGENTINA	21	14A	14	14	7B	7B	7B	14A	21A	21A	21A	21
AUSTRALIA	21A	21A	21	14	14	14B	7B	14B	14B	14	21	21A
CANAL ZONE	21	14	7A	7	7	7	14	14A	21	21A	21A	21A
ENGLAND	7B	7B	7	7	7	7B	7B	7B	14	14A	14	14
HAWAII	21A	21	21	14	14	7A	7	7	14	21	21	21A
INDIA	14	14A	14	7B	7B	7B	7B	7B	14	14	14	14
JAPAN	21	14A	14	14B	7B	7	7	7	7	14	14	14A
MEXICO	21	14	14	7	7	7	7	14	14	21	21	21A
PHILIPPINES	21	14A	14	14B	7B	7B	7B	7	14	14	14	14A
PUERTO RICO	21	14	14	7	7	7	7	14	14A	21	21A	21
SOUTH AFRICA	14	7B	7	7B	7B	7B	7B	14	14A	21	21	14A
U. S. S. R.	7B	7B	7	7	7	7B	7B	14B	14	14	14	7B
EAST COAST	21	14A	7A	7	7	7	7	14	14A	21	21A	21A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.
NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

April

SUN	MON	TUE	WED	THU	FRI	SAT
1 F/F	2 F/F	3 F/G	4 G/G	5 G/G	6 G/G	7 F/G
8 F/G	9 G/G	10 G/G	11 F/G	12 F/F	13 F/F	14 F/G
15 G/G	16 G/G	17 G/G	18 G/G	19 G/G	20 F/F	21 P/F
22 P/F	23 F/F	24 F/F	25 P/F	26 F/F	27 G/G	28 G/G
29 F/G	30 G/G					

73 T.M.

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Issue #284

Amateur Radio's Technical Journal

A Wayne Green Publication

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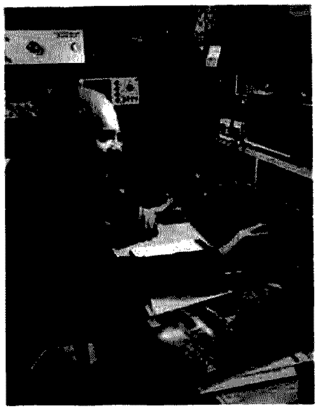
Sweepstakes Results
Did you win a piece of Wayne Green's hamshack?

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green



CODE OR NO CODE?

The FCC's lengthy release reporting on their turning down of the no-code proposal indicated that there was a great unanimity of thought by the hams and clubs who where interested enough to comment on this subject. Morse code must be kept as a fundamental skill for being an amateur—that was the edict. Presumably this was not merely an emotional response but a well-reasoned one—and thus one which all of us should expect to live with and honor.

There was a high degree of agreement that when the chips are down—perhaps referring to EMP and its destructive effect on ICs—CW can always get through. Well, heck, yes, if we have a key at hand to send CW. But more and more rigs are being made without even a key jack! I'd say that in view of this statement of amateur sentiments, we should quickly bring a halt to that and make sure that every new rig has a key jack.

Perhaps two out of three of the transceivers being sold these days are for VHF and designed for phone-only operation. Obviously we are contributing to serious future problems by moving away from the code in this way. I suggest that our first response to this unanimity on the code be to put pressure on the manufacturers not only to put a key jack on every hand transceiver, but to insist that they build a small key right into them and include a tone modulator.

If you remind the manufacturers that you are serious about Morse code—that you really believe it is important (you were being truthful in your comments to the FCC, right?)—they'll have to build CW into their rigs. And if they don't respond, I might follow up with a proposal to the FCC to make it illegal to sell a transmitter without a key jack. All hand rigs should have the complete key built in, obviously, since there is no practical way to hold the rig in one hand, the key in the other, and then try to send.

It will be easy to build a small paddle key into our HTs. With that you will be able to send with one paddle as a straight key or with both as a speed key. And, of course, speed is the only way to go for emergency communications.

Speed. Hmmm. That brings up a major problem. With CW now recognized by the FCC via your comments on the no-code proposal as being of far more importance than previously thought, we have a grave responsibility. When The Chips Are Down (WTCAD) and hams are the only means of communications in an emergency—and we have to use CW—code speed is going to be of incalculable importance. Even relatively small emergencies seem to generate enormous amounts of message traffic, so we will be in one hell of a mess if some turkey in the chain that we are depending on can't handle the code at a reasonable speed. One lazy jerk could bog everything down, bringing discredit to our entire fraternity.

Well, then, granted that your comments are right and CW is our number one means of communications, what code speed should we accept as adequate? In the commercial world, back when they used the code instead of digital communications a couple generations ago, 35 words per minute was the accepted code speed. That was average. Is there any reason why we should be any less than average? Of course not. We should be better than the old average commercial ops, right?

This means that we really

Continued on page 108

COL B. J. SMITH USAF (RETIRED)
APO SF 96298

W5RYW/DU3

BAGUIO CITY
THE SUMMER CAPITAL OF THE PHILIPPINES

RADIO ________________ CONFIRMING QSO OF
____________ UT UR SIG Q(R) ___ S __ T ___
FREQ ____________ MY XMTR ___________
AMP ______________ ANT ______________
QSL TNX ☐ PSE ☐

EX W5LON KP4NP KZ5NP W4DSL
K5JIF K8LNY DL4NL DX1LNY VS6AS

QSL OF THE MONTH

To enter your QSL, put it in an envelope along with your choice of a book from *73*'s Radio Bookshop and mail it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not in envelopes or without a book choice will not be accepted.

From Base to Beams

Home-brew from the ground up! Here's how to build a tower and top it off with performance-proven antennas.

Harry D. Hooton W6TYH
1420 Shamrock Lane
Lincoln CA 95648

During my 53 years as a licensed radio amateur, I have owned a number of masts and towers ranging from the old-time A-frame wooden mast to a modern 80-foot commercial steel tower. At the age of three score and ten plus two, I am no longer enthusiastic about climbing and working on top of a high tower of standard design and construction.

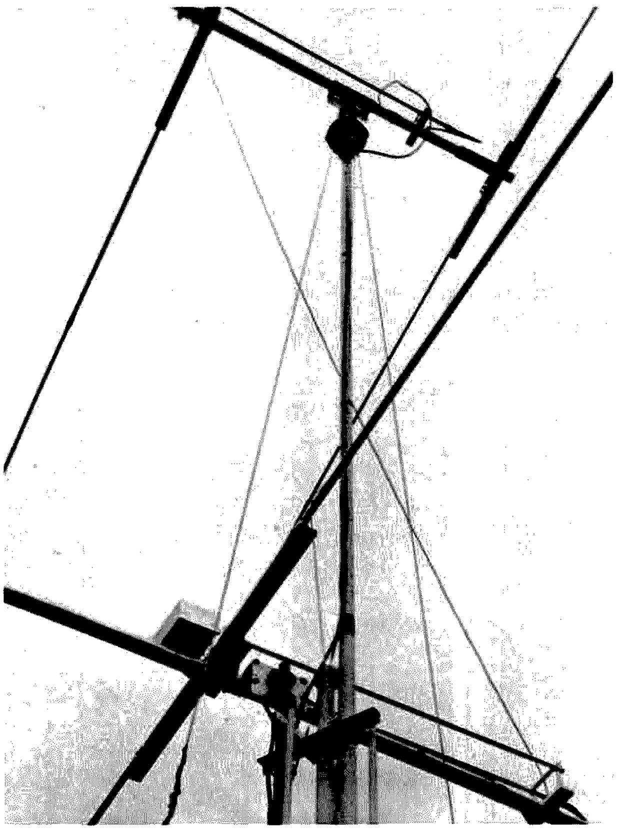


Photo A. The two monobander arrays mounted on the tower. The upper array is a 2-element, 15-meter yagi using a line-bazooka matching system. The 15-meter array is rotatable over 360 degrees. The 10-meter, 3-element yagi also used a modified line-bazooka matching system. The 10-meter array is rotatable over a 60-degree arc. The 10-meter array is used strictly for communication with the South Pacific area, VK, ZL, etc.

Since 1978, I have been experimenting with multi-mode arrays, some of which are physically large and electrically complex. These antenna systems require many measurements and adjustments necessitating removal of the array from the tower and reinstalling it after the adjustments or changes are completed. To further complicate matters, W6TYH is located in the country, far away from other hams. Most non-ham neighbors are less than enthusiastic when it comes to raising and lowering the usual amateur array that goes up or down perhaps once a year. When an array must be raised, lowered, and raised again every day over a period of perhaps two weeks, helping-hand neighbors or friends are conspicuous by their absence. Long ago, I found that the dyed-in-the-wool antenna experimenter is regarded by his neighbors (and by some fellow hams) as a kind of nutty individual to be avoided at all times when arrays are to be installed or removed from the tower.

Obviously, what is needed is an antenna support structure that can be easily installed at minimum cost and will permit one man to install or remove arrays safely and easily. The tower to be described is designed to fulfill these requirements.

Tower Design and Construction

The multi-mode array, because of its large size, requires a strong tower. Also, the tower, if possible, should be made free-standing since guys and other support devices make the raising or lowering of an array difficult. When matching or phasing adjustments are made, it is essential that the array be at least 15 to 20 feet above the ground. Otherwise, there will be an excessive amount of "cut and try," resulting in much labor and a waste of time. In the interests of economy, it is desirable to design the tower so that readily available accessories such as extension ladders, hoists, etc., can be used when required. All of the materials should be available locally; scrap or surplus iron pipe and angle-iron cross members can be used. The tower can be constructed without welding or brazing techniques (usually

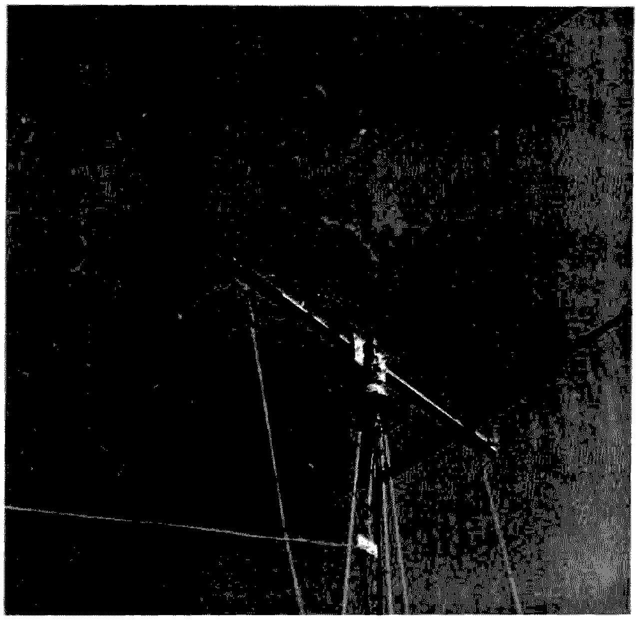


Photo B. *The tower top section showing the rotator and the 15-meter array. The matching stub, made from two copper tubes, is mounted on insulators above the boom. Note the ⅜-inch stabilizing ropes attached to the bottom of the rotator unit. Also note the trailing ⅜-inch nylon ropes attached to the ends of the boom. These are used to secure the array during windstorms. This tower and array have survived winds of over 60 mph. The tower also supports a 40-meter inverted-V dipole.*

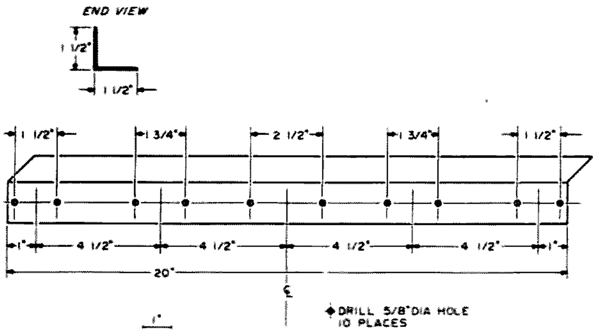


Fig. 1. Cross-member dimensions. Sixteen pieces of angle iron required—1½" wide each side.

not available to the average ham).

As shown in the photos and drawings, the tower is constructed as a cage of four ½-inch-diameter iron pipes arranged around a 1¾-inch central pipe core. The tower shown here is made up from black, non-galvanized iron pipe which was obtained from a scrap-metal dealer. To prevent rusting out with time, the black iron pipe must be painted, first with a primer coat and then with two coats of implement enamel. If you use galvanized pipe, it is not necessary to paint the tower unless this is desirable for aesthetic purposes. The four ½-inch pipes are firmly attached, by means of angle-iron cross members and U-bolts, to the large-diameter center pipe. The center pipe extends upward 20 feet above the ground. The ½-inch pipe is manufactured in 21-foot lengths. For ease in handling, each 21-foot length is cut into two 10-foot, 6-inch lengths. The shorter lengths are threaded at each end so that two or more sections can be connected together with standard ½-inch pipe couplings. The tower is extended upward by adding the 10-foot, 6-inch lengths to the desired height. Although the cage structure of this particular tower extends upward only 20 feet, it should be possible to construct a free-standing tower to a height of at least 35 to 40 feet above the ground.

If a higher cage structure is desired, the use of appropriate guys is recommended. With a 20-foot-high cage, an array can be raised to about 35 feet above the ground. With a 40-foot-high cage, an array can be raised to at least 50 to 55 feet above the ground provided, of course, that the tower structure is properly guyed. The 20-foot cage height was selected so that a standard 20-foot aluminum extension ladder can be placed against the tower, making it easier to climb.

The array is mounted on the top of a 21-foot-long, 1½-inch iron pipe placed vertically against the cage section. By means of winch and ratchet, this pipe can be extended about 16 to 18 feet above the top of the cage section for a total height of about 36 to 38 feet. This feature will be described in more detail later. The angle-iron cross members are spaced at about 2½-foot intervals up the central pipe. The tower is erected in exactly the same manner as that of a commercial radio- or TV-station tower—by adding on sections until the desired height is obtained.

Tower Installation

First, select a suitable site for the tower. If you expect to be taking arrays up and down the tower frequently, do not erect the tower against the side of a building. Make certain that the array, when mounted on the tower, can rotate freely without coming near other antennas, trees, power lines, metal roofs, or buildings. Trees and other non-metallic objects will have no effect, for all practical purposes, on the tuning or operation of an array, provided that the element tips do not approach closer than 15 or 20 feet during operation. If the array is mounted within 20 to 25 feet of a metallic object, such as a metal roof or power line, the line swr will usually vary as the array is rotated. Arrays mounted close to any object, metallic or not, are often noisy on reception.

Once the site is selected, dig a hole in the ground as shown in Fig. 2. The hole should be about 18 inches across. The depth will depend upon the type of soil at the selected site. For clay or similar hard-packed soils, a depth of about 4 feet will be sufficient. If the soil is sandy or gravelly in nature, the hole should be made deeper, to perhaps 5 or 6 feet. At the W6TYH antenna site, the soil is decomposed granite which packs solid in dry weather but becomes very soft during the rainy season. The hole for the tower base was dug to a depth of about 5 feet and side brace supports were added to the tower at a height of about 8 feet above the ground. The ends of the side supports (½-inch pipe) extend into the ground for about 3 feet and are held firmly in place by "deadmen" made by pouring concrete in each hole.

Fill the bottom of the hole to a depth of about 4 inches with egg-size gravel. Stand the large center pipe on its end on the gravel and guy or brace it in an upright position. Pour another 2 or 3 inches of gravel around the center pipe. This allows it to extend below the base of the concrete and also permits moisture from inside the center pipe to drain into

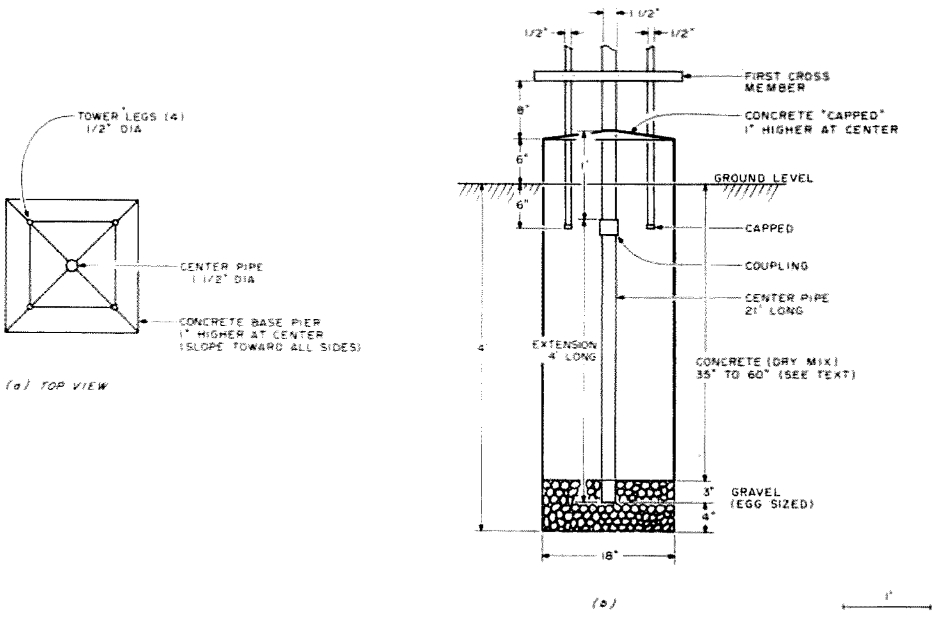


Fig. 2. Tower base.

the gravel. Before pouring the concrete mix, coat the center pipe, about 3 inches above and below the space where the top of the concrete base is to be located, with waterproof asphalt roof-patching material. Check with a carpenter's plumb and level to make sure that the center pipe is plumb before pouring the concrete, then repeat the process afterward. While plumbing the center pipe, do not pull it up into the liquid concrete or push it down into the ground. The lower two or three angle-iron cross members should be attached to the center pipe before it is placed in the hole. With the hole filled to within three or four inches below the surface of the ground, allow the concrete to "set" for about 48 hours.

After the concrete base has solidified, attach the first four ½-inch iron-pipe cage uprights as shown in Fig. 3. The bottom ends of the ½-inch pipes are capped and will extend downward about four inches below the space where the top of the concrete base will be located. It is not necessary to provide for drainage of the side pipes provided that each member is sealed by the caps at the top and bottom. When the side pipes are securely fastened to the angle-iron cross members, using the smaller U-bolts, finish pouring the concrete and crown the top of the base, as shown in Fig. 4, to prevent water from accumulating at the point where the upright

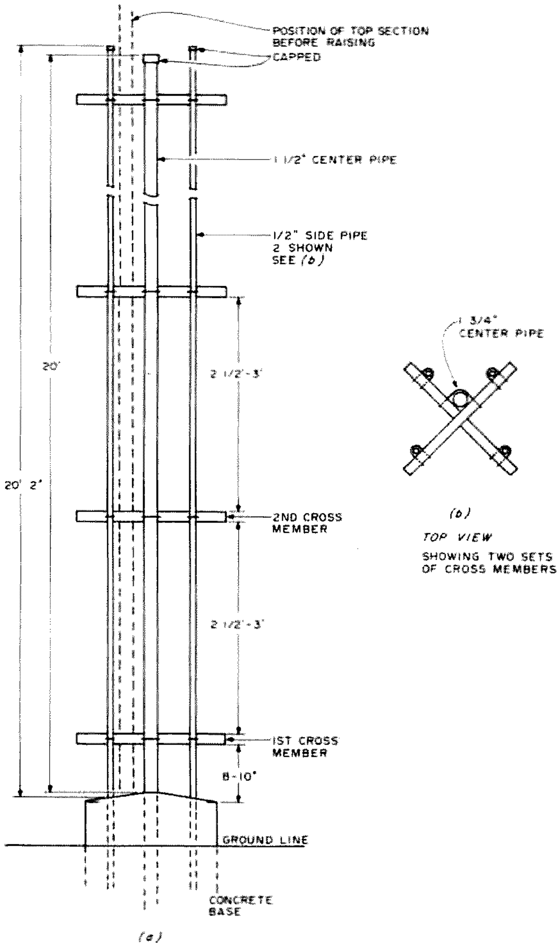


Fig. 3. How ½" pipes are attached to vertical center pipe.

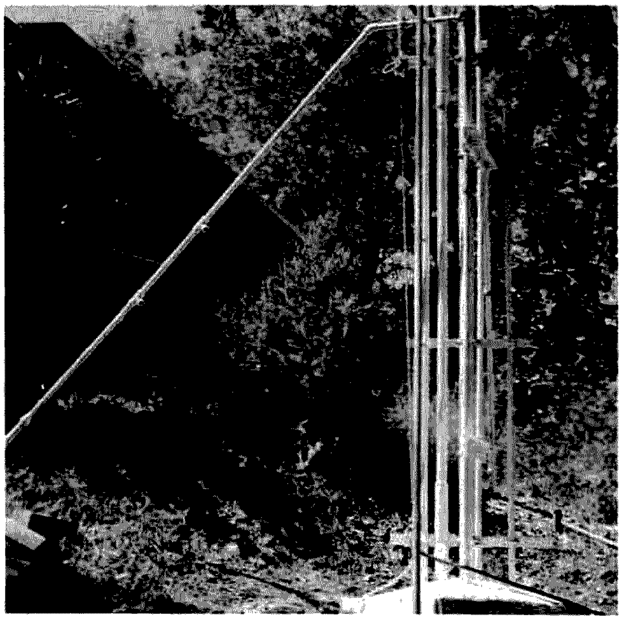


Photo C. Lower section of tower showing construction. The tower has two braces (½" pipe) attached 8 feet above ground. The lower cage section extends upward 20 feet above the concrete base.

members enter the base. Again allow the concrete base to harden for about 48 hours before assembling the remainder of the tower.

After the base section has been installed, mount the angle-iron cross members at intervals of about four feet, all the way up to the top of the center pipe, and secure the four ½-inch pipes in place with their U-bolts. The U-bolt nuts should be drawn tight so that the joint is rigidly secure.

Although this tower is sufficiently strong to be self-supporting at heights of up to 40 feet, for safety's sake, while working on the tower, it is advisable to attach at least three guys at the 20-foot level, space them around the tower 120° apart, and secure them to iron stakes driven into the ground. There is always the possibility when working on a new tower that the concrete is not completely set and the tower may fall when it is unbalanced by the weight of a man climbing it.

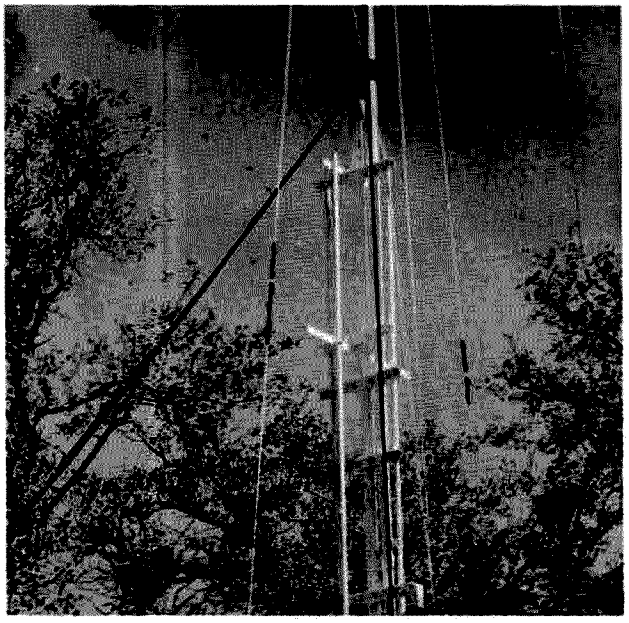


Photo D. Midsection of tower showing how top section of pipe is mounted. The top section can be extended 18 feet above the 22-foot bottom section—a total height of 40 feet. Note that the 52-Ohm coaxial cable and the rotator control cable are dressed away from the tower while the top section is being raised.

The Adjustable Upper Section

After the 20-foot cage (lower) section has been installed, the adjustable upper section, a 1½-inch-diameter, 21-foot-long iron pipe, is placed vertically against the cage section, parallel with the 1¾-inch center pipe. The lower end of the adjustable section rests on top of the concrete base. With a rope or wire, temporarily tie the 1½-inch pipe to the center pipe at the top, center, and bottom of the cage section to keep it upright. Prepare four 1¾-inch U-bolts as shown in Fig. 5. The two standoff nuts on each U-bolt will allow the U-bolt to be rigidly mounted on the angle-iron cross members and keep the 1½-inch pipe upright while permitting it to be raised.

This method is probably the simplest means of allowing the upper section to be raised or lowered while still maintaining a safe and strong mount. If the upper section is to be left permanently in the raised position, when it is in its final position, each of the 1¾-inch U-bolts is removed, one at a time, and the two standoff nuts are removed. The U-bolt is now reinserted through the two holes in the angle-iron cross member and its two remaining nuts are drawn down tightly. If the upper section is to be raised and lowered frequently, leave the U-bolts as originally installed and secure the top section as will be described later.

Depending on the height of the lower cage section (20 feet in the prototype tower), the 1½-inch pipe will extend about 1 or 2 feet above the top of the cage section. Thus, it can be reached easily from a 20-foot aluminum extension ladder placed at an angle against the side of the tower. In the photos and drawings you will notice that the last angle-iron cross member, at the top of the cage section, extends outward about 6 inches from each ½-inch side pipe. My 20-foot extension ladder is fitted with two bicycle-hanger hooks at the top. When the ladder is extended, the two hooks fit over the ends of the angle-iron cross members, keeping the ladder securely in place. The lower end of the ladder rests on the ground but is held in place by tie wires to two iron stakes driven into the ground. Since the ladder is placed against the tower at an angle, it is much easier to stand on and more comfortable than trying to hang on to the tower with one hand and work with the other. A strong web safety harness attached to the tower enables me to work in comfort and with safety.

Installation of the Rotator Unit

The array shown in the photos is a 2-element beam antenna similar to that described in the May, 1980, issue of *73*. The rotator unit used with this antenna is the CDE AR-22 which is de-

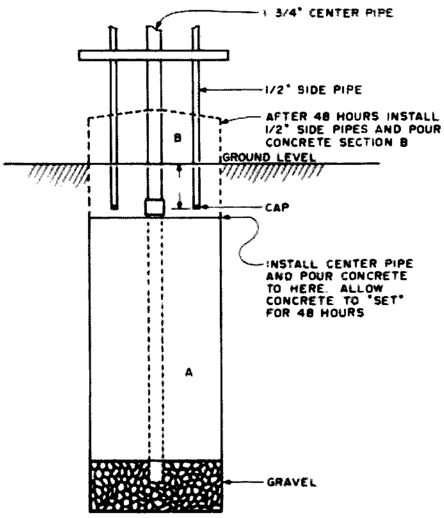


Fig 4. Second step in pouring concrete base.

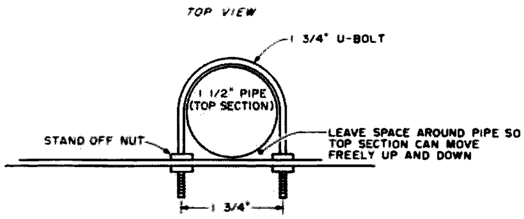


Fig. 5. U-bolts for supporting top section.

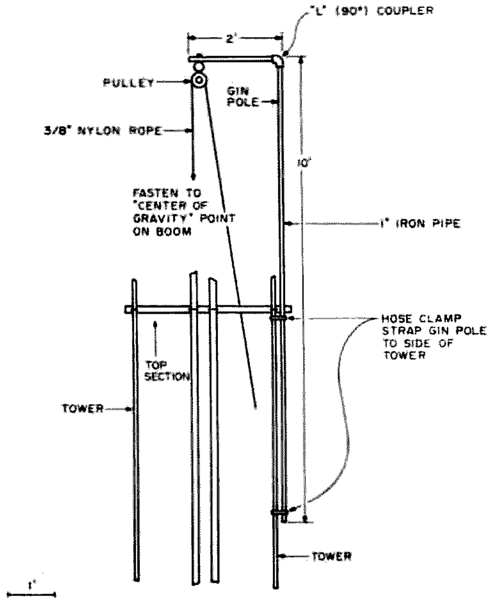


Fig. 6. Gin-pole assembly for raising array.

signed for use with large TV receiving antennas. This rotator is perfectly suitable for short-boom, 2- or 3-element beam antennas designed for operation on 10 or 15 meters. For long-boom arrays, use the Ham rotator which is designed to support and rotate a much heavier load. When the AR-22 or any similar unit is used with long-boom arrays, the up and down rocking motion of the boom in a windstorm will damage the gears of the rotator unit.

If you look closely at the photograph, you will notice a trailing ¼-inch nylon rope attached to each end of the boom. In normal use, the ropes simply hang down and rotate with the antenna. During windstorms, however, they are used to lash down the array to prevent the rocking of the boom referred to above. Two other ¼-inch nylon ropes are attached to the guying loops on the bottom edge of the rotator unit and serve to stabilize the upper section and the array during severe windstorms. Using these precautions, the tower and array have been subjected to a 70-mph wind without damage.

The 4-wire control cable should be attached to the rotator before it is installed on the tower. The terminal boards on both the rotator and control units are marked 1, 2, 3, and 4, left to right. The flat 4-wire rotor cable has one bright (tinned) conductor and three plain copper wires. The tinned (bright) lead connects to terminal 1 on both the rotor and control units. The second conductor is then connected to terminal 2, etc. If the terminal boards are wired in this manner, either unit may be disconnected and reconnected without wiring errors.

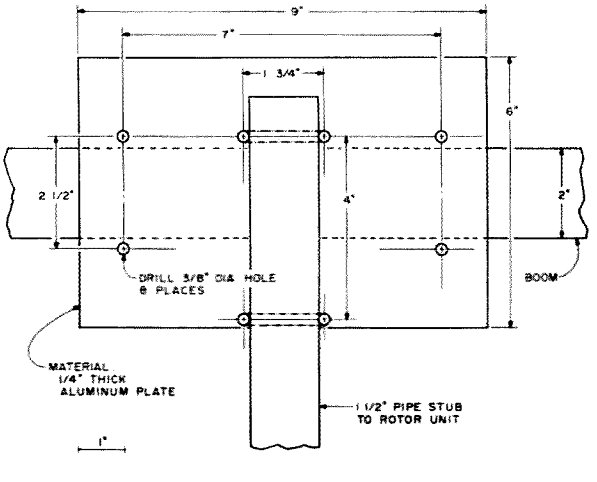


Fig. 7. Boom-to-stub mounting.

After the rotator and control units are electrically connected together, plug the control unit into the 110-V-ac source and turn the indicator pointer to NORTH. When the rotator has stopped turning, mark one side of the upper section with chalk or a spot of white paint. When the rotator is installed on the top section, turn the marked side of the unit toward the north. Tighten the mounting U-bolts until the saw teeth of the clamps bite into the metal pipe. The easiest way to lift the rotator unit to the top of the cage section is to raise it with a rope and pulley. With the safety belt or rope attached to the tower, lift the rotator unit over the top end of the 1½-inch pipe, turn the white spot toward the north, and tighten the U-bolt nuts.

Installing the Array

For an easy installation of the array, make up a gin pole as shown in Fig. 6. The 12-inch L arm has an attached rope and pulley as shown. If the array weighs 40 pounds or less, the rope can be a length of ¼-inch nylon. For heavier arrays, a ½-inch nylon rope is recommended. Make sure that you have the proper size pulley for the rope in use and that the rope runs freely through the pulley opening.

One end of the rope is tied to the center-of-gravity point on the boom. Have someone hold the other end of the rope, taking up the slack as you climb the ladder guiding the array up the tower. When you reach the top of the ladder, have the assistant pull on the rope to raise the array to a point about a foot or so above the top of the rotator. Carefully lower and guide the array mounting stub into the rotator mount. Tighten the U-bolt nuts until the teeth of the clamps firmly dig into the metal pipe stub. The boom-to-stub mounting assembly is illustrated in Fig. 7.

Raising the Top Section

After the rotator and the array are installed as outlined above, we are ready to raise the top section to maximum height. The coaxial transmission line is connected to the array feedpoint before the top section is raised. The junction of the line and the feedpoint must be wrapped with several layers of plastic tape to prevent the entry of moisture. If the coaxial line is made a multiple of a half wavelength, the swr bridge can be inserted in series with the line at *any* half-wave point and the swr or impedance value indicated will be the same as that at the array feedpoint. The coaxial line and the control cable should be dressed away from the tower while the top section is being raised. Use plenty of slack in these lines to prevent them binding or snagging on the tower cross members.

As mentioned previously, the 1½-inch pipe top section is held in the vertical position by the U-bolts acting as slip rings. If you intend to raise or lower the top section frequently, it is worthwhile to install a low-cost winch and cable assembly, such as that used on trailers for small boats, to allow the section to be cranked up or down with little effort. Since W6TYH is located on a ranch, we have available several devices

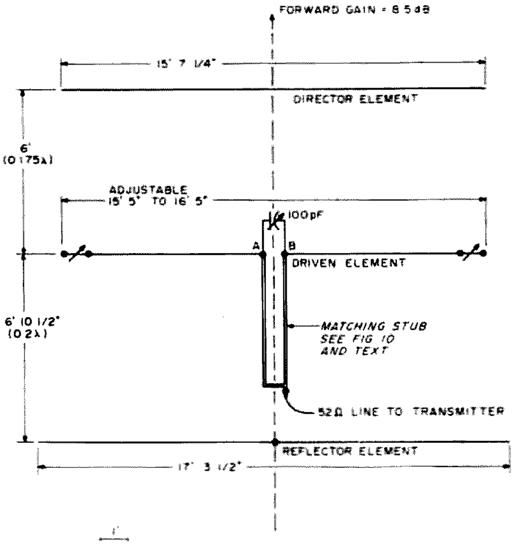


Fig. 8. Dimensions of 3-element 10-meter array.

that are useful for lifting or hoisting heavy objects such as the tower top section. The device that we used is generally referred to as a "come-along" and has a ratchet operated by a long handle. To raise a load, the handle is pumped in the same manner as that of an automobile jack. A small-size hoist that sells for about fifteen dollars at auto parts stores will lift an 800-pound load to about 20 feet.

Guys

This tower is free-standing and is not guyed in the usual sense of the term. However, a pulley with about 100 feet of ⅜-inch nylon rope is attached to the lower section of the rotator unit, primarily for the installation of a 40-meter inverted-V dipole antenna. In addition, two 60-foot, ⅜-inch nylon ropes are tied to the guying loops at the bottom of the rotator. During normal weather conditions, these ropes are simply dressed down one side of the tower and secured to the lowest cross member. During high winds, however, the ropes can be played out as guys and used to stabilize the tower. Also, you will notice that each array has a length of ⅜-inch nylon rope trailing from each end of the boom. During normal operation, these ropes simply hang down and rotate with the array. When the weather is bad, with strong winds, the trailing ropes are secured to the tower to prevent the arrays from rocking up and down which might damage the gears of the rotator unit.

The Arrays

This tower has supported many arrays during the past several years. Photo A shows the tower with the two arrays in use at present. The upper array is a 2-element, 15-meter beam antenna which was described in the May, 1980, issue of *73*. This array, the LB-2, has been in use for about 7 years and has proved to be an excellent DX antenna for both transmitting and receiving. The forward gain is 5.3 dB over a dipole under similar operating conditions. For constructional and adjustment data, refer to the article in the above-named issue.

The second array (at the lower level) is a 3-element, 10-meter array designed for maximum forward gain consistent with optimum front-to-back ratio. The forward gain is 8.5 dB over a dipole. The spacings of the elements and the element lengths, together with the dimensions of the matching system, combine to produce a perfect impedance match between the array feedpoint and the 52-Ohm coaxial transmission line. The dimensions of the 3-element array are given in Fig. 8.

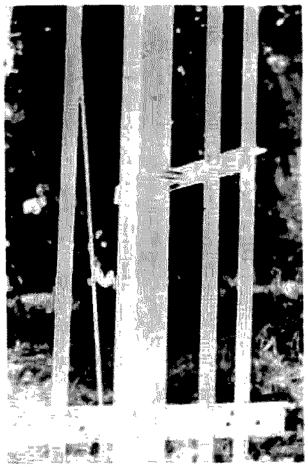


Photo E. Cross-member constructional details.

The driven and parasitic elements are made up from the popular "hobby" aluminum tubing sold at many hardware stores and building-supply houses. The center sections are 8-foot lengths of ¾-inch-diameter tubes (0.055-inch wall thickness). With the 0.055-inch wall thickness, a ⅝-inch o.d. tube will telescope snugly within the ¾-inch o.d. tube.

The inside and outside surfaces of these tubes have an oxidized finish which must be removed from the two surfaces that make electrical contact. To remove the oxidized finish from the telescoping portion of the smaller tube, sand its outside surface with 00 sandpaper and then polish it with steel wool until the surface is bright and shiny. The finish may be removed from the inside surface of the larger tube by wrapping a smaller diameter wooden dowel with a strip of sandpaper or emery cloth and moving it up and down inside the tube until the inner surface is bright and clean. Before the elements are finally assembled, the telescoping contact surfaces should be coated with an antioxidizing compound, available at most electrical-supply stores.

After the reflector and director elements are assembled and adjusted to the correct lengths, the electrical connection may be made secure by four or five self-tapping stainless-steel sheet-metal screws arranged in a spiral around the tube. After the joint is made secure electrically, wrap it with several layers of plastic tape to keep out air and moisture. If each end of each element is sealed with a wooden plug and waterproof cement, the joints will not corrode and will maintain good electrical contact for several years.

The Driven Element and Matching-Stub Adjustments

In the stub-matching system, the dimensions of the stub and the overall length of the driven element are critical. The stub acts as an inductive reactance (X_L) and the antenna is adjusted to act as a capacitive reactance (X_C). The correct combination of the two reactances will resonate the driven element at the desired frequency, 28.6 MHz in this case. The stub also acts as a balun, converting the 52-Ohm unbalanced impedance at test point A to a balanced 17- to 20-Ohm impedance at the center of the driven element. The impedance stepdown ratio (about 3 to 1) is determined by the ratio of the stub, X_L, and the antenna, X_C. With stubs of the specified dimensions, the length of the driven element, tip to tip, will be about 5 inches shorter than the length required for resonance with the common gamma match. The bandwidth of the array, each side of the center frequency, is dependent upon the correct ratio of the two reactances and the spacing of the two stub conductors. Extensive experimental work has

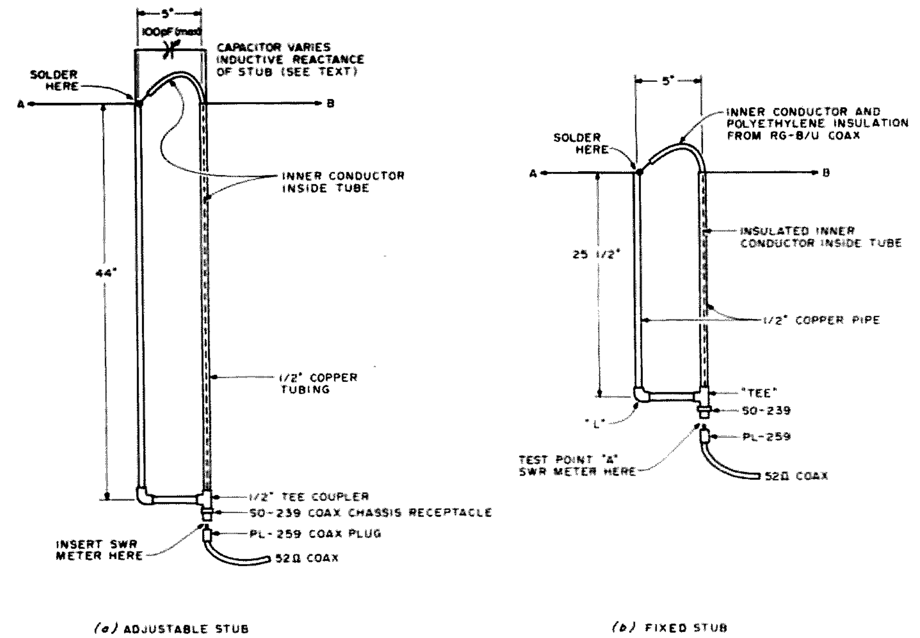


Fig. 9. Matching stubs for 10-meter array.

shown that best results on the 15-meter band are obtained with the two ½-inch tubes spaced 3½ inches, center to center. This spacing corresponds to a surge impedance of about 360 Ohms. With a shorted stub 45 inches long and spaced 3½ inches, the bandwidth of the LB-2 array is flat (1 to 1 swr) from 21.050 MHz to 21.400 MHz. At 21.0 MHz and 21.450 MHz, the swr is about 1.3 to 1. The forward gain is virtually constant across the entire 15-meter band. With the array shown in the photos, no antenna tuner or matching device is used even with solid-state output circuitry in the transmitter.

For the 10-meter array, the stub tubes are spaced 5 inches apart, center to center. Either of two stub types may be used. For the simplest possible adjustments, use the short stub with the fixed-position shorting bar. The 25½-inch length is correct for the center frequency of 28.6 MHz. For a center frequency of 28.4 MHz, the stub should be made 26 inches long. For a center frequency of 28.8 MHz, the stub length should be made 24 inches long. With this stub, it is only necessary to carefully adjust the length of each half of the driven element until a zero reflected-power indication is obtained at test point A or at any half-wave point along the transmission line away from the antenna. To maintain electrical balance in the array, each half of the driven element should be lengthened or shortened by the same amount. The electrical balance of the array can be checked by touching each end of the driven element, in turn, with a fingertip. The swr indicator deflection from zero should be the same when touching either end of the element. The electrical balance of the parasitic elements can be checked in the same manner. It will be found that the director-element tips are

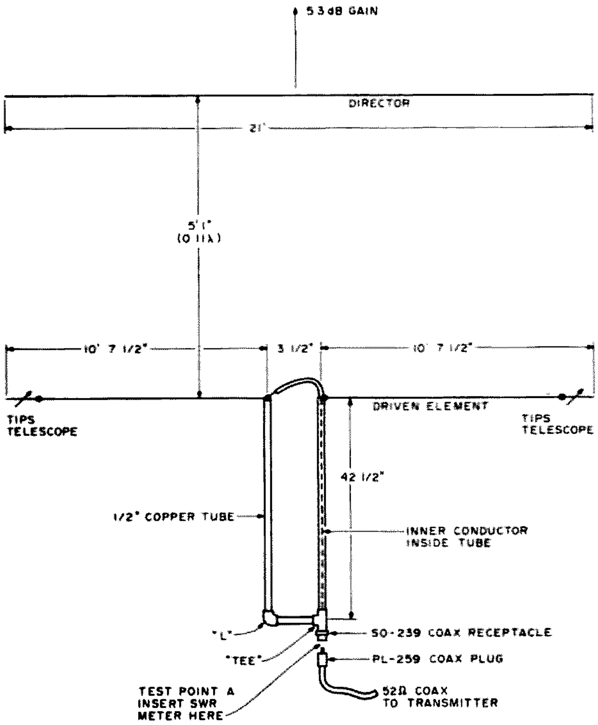


Fig. 10. 15-meter array.

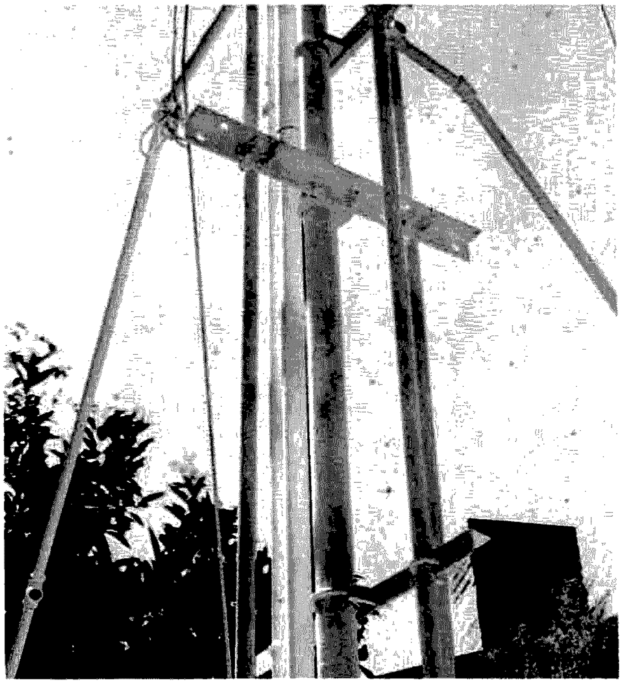


Photo F. Bracing details.

very sensitive to any conductive object while the reflector-element tips are relatively insensitive.

The long-stub conductors are each 44 inches long and spaced 5 inches apart. The stub alone has an inductance value greater than that required to match the 52-Ohm line to the balanced driven-element feedpoint. The inductance value can be reduced by shunting a 100-pF air-dielectric variable capacitor across the open end of the stub. In this application, the variable capacitor action is similar to that of an adjustable shorting bar, allowing the stub inductance to be adjusted as required.

To start the matching procedure using the long stub, adjust the variable capacitor to about one-half maximum capacitance (about 50 pF). Adjust the driven-element length, tip to tip, to about 16 feet, 5 inches. Make sure each half of the driven element is the same length. Connect the swr meter (bridge) in series with the 52-Ohm line at test point A or at any half-wave point along the line away from the array. To the transmitter end of the 52-Ohm line, apply an unmodulated carrier of 28.6 MHz and about a 5-Watt power level. Adjust the swr meter indicator for exactly full-scale indication in the forward selector-switch position. Change the switch to indicate reflected power. Carefully adjust the length of each half of the driven element until zero reflected power is indicated on the swr meter. After the array has been installed on the tower, the variable capacitor is adjusted to correct any detuning of the driven element when it is removed from the vicinity of the ground. The electrical balance of the array is checked as outlined above. ■

A Little Gem for QRP

The T2FD antenna thinks it's a full-size rhombic. Feeding is believing.

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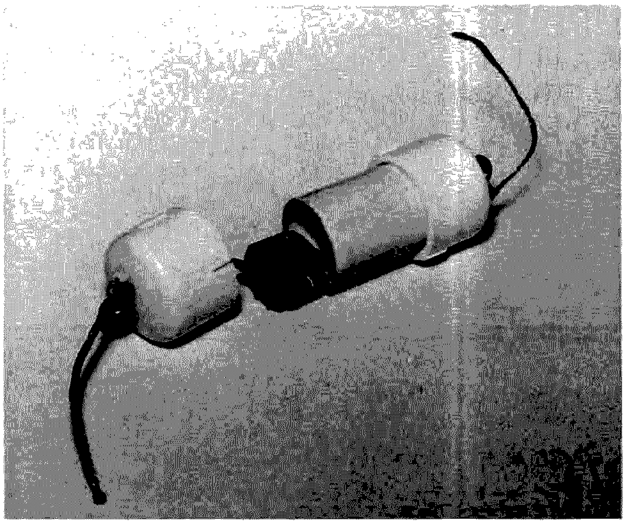
While much has been written about antennas in general, little has been published about outstanding radiators for serious QRP work. From reading some of the journals, one would think that QRP is illegitimate unless transmitted from a dipole buried in the basement. Since I do not subscribe to the premise that a second-rate antenna is required to operate QRP, I constructed a QRP version of W3HH's T2FD antenna. This little gem is a real performer, and I would like to share with you the plans for its construction.

For those not familiar with the antenna, a little history is in order. T2FD means terminated folded dipole. This antenna reminds me of a folded-back terminated rhombic. The initial data appeared in *QST* in June, 1949. The next article appeared in *CQ* in November, 1951. *CQ* also published a book called *Antenna Roundup* in 1963. It contained two very informative articles on this antenna.



The terminating-resistor assembly.

I constructed one of these antennas prior to the Xenia, Ohio, tornado in April, 1974. I was using a custom-made high-power terminating resistor, and since it could not be replaced, I did not consider rebuilding this antenna after it was destroyed. By the time we moved to the country, I had forgotten how well this antenna performed.

After moving to the country, we installed a wind-powered electric system, and QRP seemed very appropriate. After optimizing our electric system, I was not willing to operate with a second-rate antenna.

After looking through several antenna books, I ran across my old friend T2FD. The terminating resistor has always been the difficult item to obtain. Since I wanted to operate with five Watts, I figured it should be easy to parallel two-Watt carbon resistors for any value I needed. This was the birth of my QRP T2FD.

The antenna is configured as a sloping folded dipole. One end of the antenna is attached at an appropriate height on a tower or pole and the other end can be tied to a fence post or what have you. In the drawing, you will notice that it is fed with 300-Ohm TV-type ribbon. This antenna can be fed with other impedance lines, but it is beyond the scope of this article to cover all possible designs. If 300-Ohm feedline is not acceptable, I would suggest you research the previously-mentioned articles for complete design information. I chose 300-Ohm feedline because it was cheap and readily available.

Constructing the Terminating Resistor

For 300-Ohm feedline, the terminating resistor is a rather critical 390 Ohms. It just so happens that ten 3900-Ohm, two-Watt resistors in parallel will give us 390 Ohms at a 20-Watt rating. So far, so good. A 1-1/8-inch hole saw will cut two circles in a piece of circuit board faster than I can describe it. These two circles will form the end plates for a resistor cluster pack. Holes are drilled through the board so that three resistors are centered around the middle of the circle. Then the remaining seven resistors are equally distributed around the circumference. This procedure is repeated on the other end plate. When all the resistors are properly aligned with the copper side of the circuit board facing away from the

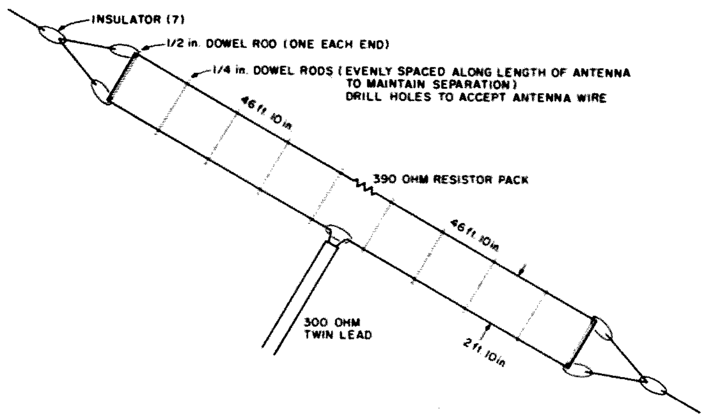


Fig. 1. 80-meter version of the T2FD antenna.

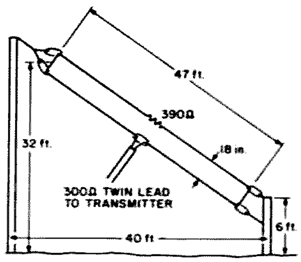


Fig. 2. 40-meter version of the T2FD antenna.

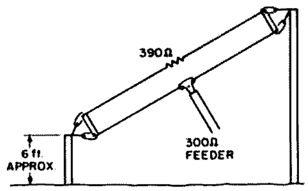


Fig. 3. Erect the antenna so that the angle of tilt is from 20 to 40 degrees for omnidirectional operation.

resistors, the assembly may be soldered. The result will be ten resistors wired in parallel.

This resistor pack will now have to be weatherproofed. The following materials will be needed: one piece of PVC pipe 3½" long and 1¼" in diameter; two 1¼" PVC end caps; two screw eyes with lock washers and nuts; two large flat washers that will just fit inside the end caps; two nine-inch-long pieces of ¼" tinned braid; one tube of GE silicone rubber cement; and a small can of PVC pipe cement.

Drill a hole through the center of the pipe caps. Drill a second hole next to this center hole. This second hole is where the braid will come through. Thread the braid halfway through the second hole. Insert the eyebolt through the center hole. Now put the large flat washer inside the pipe cap, bringing the braid out around the inside. Slip on the lock washer and nut and tighten down the assembly. A little silicone rubber cement will waterproof the hole where the eyebolt and braid come through the end cap. Repeat the procedure for the other end cap and allow both ends to dry.

The next step is to trim the braid on the inside of the end caps to the shortest length that can be readily soldered to the copper foil of the resistor pack. Solder the braid of the other end cap to the other end of the resistor pack. Cement both ends of the PVC pipe liberally and shove the assembly together. Allow it to dry while you work on the remainder of the antenna.

Sticks and Stuff

Since the antenna is for 80 meters, the total length is a little over 90 feet. Separators must be used to keep the antenna aligned. Eight wooden dowel rods 3 feet long and ¼ inch in diameter will fill the bill. For the end separators, we will need two dowels 3 feet in length but ½ inch in diameter. Five small porcelain insulators will be needed, one for the center and two at each end. Plastic separators would be preferable but wooden dowel rods that have been soaked in oil will weather reasonably well.

The two sides of the dipole must be separated by 2 feet 10 inches. This makes it easy using the 3-foot rods. Measure back one inch from each end and drill your holes. These holes should be drilled before the rods are soaked in oil.

Bits and Pieces

The assembly of the wire part of the antenna should be apparent from the drawing. The wire should be cut to the correct length each side of center, and the separators should be threaded on the wire. When this is completed, the center insulator and terminating resistor can be installed. The braid coming through the end caps should be soldered to the antenna wire connected to the eyebolts. This will make a good electrical connection from the resistor pack to the antenna while the eyebolt will take the weight of the antenna off the internal resistors. The 300-Ohm lead-in wire should now be soldered to the center insulator feedpoint.

We are now ready to pull the antenna up into position. It does not matter how the antenna is oriented with reference to the ground. It will probably lie horizontally. This is not important to its operation, but it should slope toward the ground at about a 30-degree angle. This antenna does not require much real estate and should be popular with those living in the city.

Basic design information is included on the drawing in case you may want to scale down this 80-meter version to 40 meters. If constructed as shown, this antenna will operate on all bands from 80 through 10 meters, including the new 30-meter band.

Feeding the Baby

The T2FD is best fed with an antenna tuner. Any balanced-output tuner that will match 300 Ohms to 52 Ohms should do fine. I am using a very uncomplicated home-brew tuner with excellent results. QRP can be very challenging and a lot of fun. This antenna will give good results with a minimum of space needed. Good luck, and I'll be looking for you on QRP CW. ■

T2FD Basic Design Data

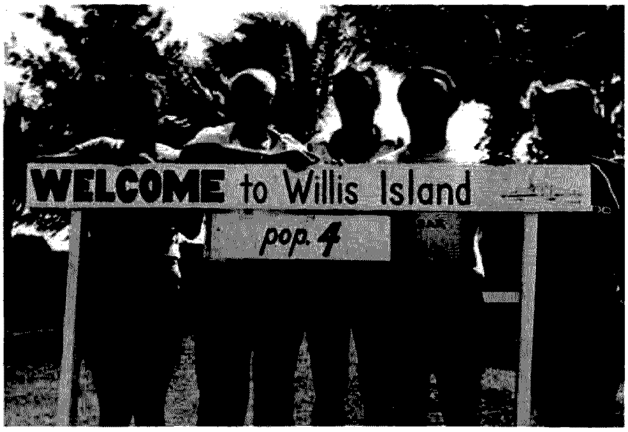
1. The length of each leg from the center is equal to 50,000 divided by the lowest desired operating frequency (in kHz) and then multiplied by 3.28. The answer is in feet.
2. The spacing between radiating wires is equal to 3000 divided by the lowest desired operating frequency (in kHz) and then multiplied by 3.28. The answer is in feet.
3. The sloping angle for a nondirectional pattern should be of the order of 30 degrees.
4. The terminating resistor should be noninductive and have a rating equal to 35% of the transmitter input power.

"The Tops of the Palm Trees"

20,000 QSOs. Coral Sea. Banyandah.

Harry Mead VK2BJL
PO Box 85, Round Corner
2158 N.S.W., Australia

Within the compass of Oceania there are a few DX locations that are rarely visited because of sheer inaccessibility, and they rate highly on the most-wanted lists of amateurs around the world. Mellish Reef is in that category. It is an isolated volcanic peak rising a few meters above sea level from the depths of the Coral Sea, far removed from any shipping lanes and about 600 miles from any habitation—with the sole exception of the small weather crew on Willis Island. Few people have trod the coarse coral sand that hides the volcanic ash and supports vast numbers of gannets and frigate birds who annually nest and raise their young amongst its sparse vegetation. Nor can it be found on any but the most comprehensive maps since it has little significance in any of man's activities.



The team on Willis Island, with Tony VK9ZH, center.

Discovered by the British survey vessel *HMS Herald* in 1827 and charted for the admiralty, the major cay inside the lagoon was named Herald's Beacon. The minor cay about four miles north of it remains uncharted to this day, and it is probable that no human foot has ever been set upon its shores.

The late John Martin VK3JW led an expedition of Australian amateurs there in 1973, and I headed an international group of amateurs in 1978 for a second postwar activation of the reef, but by late 1981, Mellish Reef had once more climbed into the top 50 of the world's most-wanted DX locations. After our 1980 expedition to ZM7, Jack Binder KB7NW had gone down to New Zealand for a refit to his ketch *Banyandah* and was due to return to Australia early in 1982. We had been discussing another DXpedition, and one to Mellish Reef was the logical choice after our hopes for a trip to the Kermadecs had been frustrated.

Jack and I held a weekly sked which now was taken up with detailed planning. First, we established a time slot for the operation: It had to be later than the hurricane season and early enough to take advantage of favorable winds. It was also important that we be there during or near the peak of the equinoctial propagation since the sunspot cycle was rapidly on the decline. The cyclones traditionally move north during April and it would be unlikely that we would have one in the Coral Sea after that date, but on the other hand, the equinox was then five weeks past. The favorable wind would continue for several months, so a compromise was made between the two former criteria and we settled on sailing from the mainland during the first week in May. Allowing for a three-day stopover at Willis Island for some CW operation, Jack calculated that the round trip could be accomplished in three to four weeks.

Our next task was to re-

cruit a crew to man the expedition. There are many factors that influence the success or otherwise of an expedition, but none more than the caliber of the team involved. In this respect, it would be hard to find a better group that had all the vital elements necessary to achieve success. Franz Langner DJ9ZB with Bruce Johnson VK3DHT would concentrate on handling the phone section while Fernando Fernandez EA8AK and I would devote most of our operating to CW.

Once the team was established, the logistics were tackled and sponsorship sought. Jack had purchased two Onan generators, two tents, and many of the vital supplies in Hawaii prior to the Kingman Reef and Palmyra Island expedition. They had been purchased after considerable debate as to the most suitable for use under extreme conditions and had served well on KH5 and ZM7. Rigs and antennas would come from our own resources.

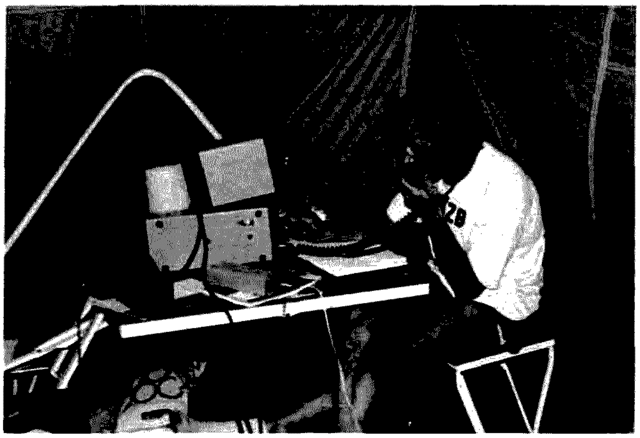
Like all other enterprises, inflation has affected the cost of DXpeditions. Major expeditions are becoming less and less viable; therefore, a substantial donation from the North California DX Foundation was of great assistance to our venture. Nevertheless, the dream of a major annual DXpedition has often gone under from the sheer weight of escalating costs.

We arranged to assemble in Sydney and drive up to Queensland to our point of departure. Fernando had left the Canary Islands early to visit the conventions at Fresno and Dayton and was the first to arrive in Sydney, followed by Bruce a few hours later with Franz arriving the following morning. Jack had taken *Banyandah* up to Bundaberg, and on our final sked before departure asked us to be alongside the dock around noon of the following day so that we could sail on that afternoon tide. He took on fuel, gasoline for the generators, and fresh supplies as we drove north 1500 kms with 25 hours before sailing time (Bruce and I sharing the driving). We gave Franz and Fernando a memorable ride through some of Australia's outback and managed a few hours sleep just north of Brisbane at Caboolture, to arrive almost to the hour alongside *Banyandah* at Bundaberg. With the rigs and antennas stowed aboard, the auto was handed over to be stored in Brisbane awaiting our return. With our personal gear stowed and sleeping quarters allocated, we were ready to sail.

Two hours later we were at the mouth of the river. As the sun began to set and the lights on the shore slowly dropped astern, with sail set and a stiffening breeze we headed out to the edge of the Barrier Reef and the open seas ahead.

The morning of May 3rd saw us clear of the reef on a northeasterly course for Frederick Reef. *Banyandah* was making a steady seven knots in moderate seas, with whitecapped waves rolling along with us, an occasional porpoise rushing across our bows, and flying fish skimming across the troughs of the waves. With only a few puffy white clouds scudding across the sky, star sightings at night and sun shots during the day gave us continual navigation checks and confirmed that we were making excellent time.

Because of the whitecaps, we stood well clear of Samauriz Reef. We looked for the wreck which we had clearly seen on our previous trip, but as we could see the heavy breakers along the reef as we passed along its length, we surmised that she had broken up and disappeared in the intervening years.



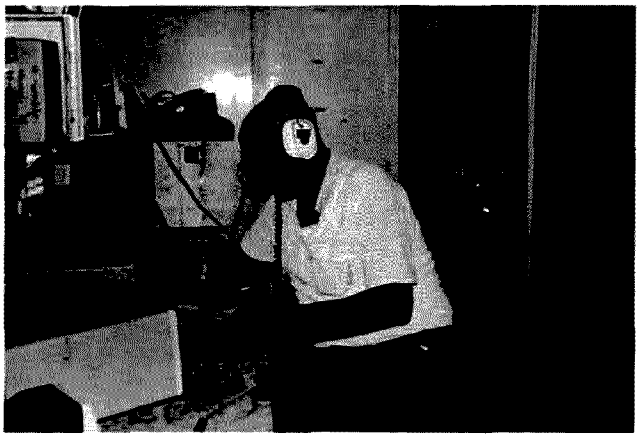
Franz DJ9ZB operating with the TS-520.

On the third night we saw the loom of the unattended light on Frederick Reef and made a running fix as we passed; it would be our last terrestrial fix before we reached Mellish Reef.

The fourth day out the winds slackened, and by nightfall the sails were flapping idly in the soft breeze. Jack started the engines and took the sail in. With less than sixty miles to go, we felt a little disappointed that the wind had not held to see us right in, even though it would have made little difference. The sun would need to be high in the sky to help us to see our way through the reef, and sailing or motoring, we had time in hand.

At daybreak on May 7th, Jack waited for the sun to get high enough in the sky to get a fix and, having done so, climbed the mast, scanning the horizon for a sign of the reef. That we were not far away was evident by the large number of sea birds wheeling around. Another sun shot, a recheck of the calculation, and we were certain that we were on the correct latitude. Were we east or west of our destination? It was an even chance. We could not wait until nightfall to take star sights; a decision must be made. If it was wrong, we stood to lose a day; if it was correct, we would find the reef while the sun was high and we could go in.

The birds appeared to be coming from the west. If that were so, then the reef lay to the west. We turned westward and once more

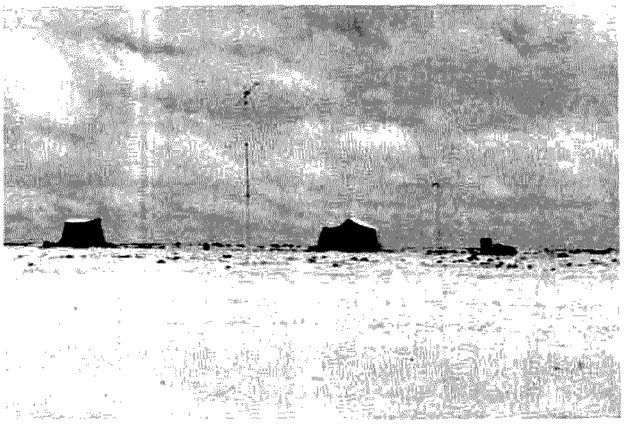


The author operating from the weather station on Willis Island.

Jack climbed the mast and scanned the horizon; in less than an hour he saw breakers to the northwest about five miles away. A new course was set, hands were shaken, backs were slapped, and smiles wreathed our faces as we peered ahead waiting for the breakers to be visible from deck level.

Judith took the wheel; Jack once again climbed to the masthead and guided *Banyandah* closer to the outer reef, carefully threading the ship between the jagged coral heads, black and menacing just below the surface, until we found the charted boat passage inside the reef. The thin edge of white sand was now clearly visible, and slowly we inched *Banyandah* through the gaps in the coral heads, some of which were now just awash, waving their long fronds like cheerleaders at a ballgame. We steadily closed the distance between *Banyandah* and the shore until, 300 yards out, the coral heads surrounded us on three sides. Engines were stopped, the bow anchor dropped, and we halted. A stern anchor went down, the slack was taken up, and we had arrived.

It was still before noon, so we had many hours of daylight left to get ashore and set up. Jack got the dinghy launched and the outboard fitted, and he set off for the shore with Franz whilst Judith and the rest of the crew brought the rigs and equipment on deck. We followed closely our prearranged plan: I joined Franz ashore and we proceeded to assemble one of the beams. Fernando and Bruce followed and, with Jack, erected the first tent. Very soon we were ready to put the first station on the air. The generator started on the first pull; a quick check of the bands showed 15m and 20m wide open, with a few signals evident on 10m. I tuned up the 901DM, called CQ on 14195, and was answered by VK2DJE; within a minute, a pileup had started. I handed over to Fernando, joined the others in getting the second antenna up, and we got Franz away on 21 MHz. VK9ZR was away to a good start.



The operating site on Herald's Beacon.

With everything squared away, Fernando and Franz settled down to a steady rate of QSOs; Bruce, Jack, and I straightened our backs and took stock of the island. Jack and I were dismayed at the devastation of the island now compared to how it had been during our previous visit. The cay had been swept recently by Cyclone Bernie and most of the hardy foliage that had once spread thinly over the surface of the island had vanished. So had most of the coral sand, leaving the fragmented volcanic ash exposed, littered everywhere with dead and rotting carcasses of birds. We counted over 700 carcasses—probably twice as many had been swept into the sea. Those birds which had survived were still distraught and startled, and as the sun set and for long after, they wheeled and screamed over and around the island like a swarm of starlings scattered by a farmer's gunshot. Where previously it would have been difficult to pick a way between the nesting birds, only the occasional hermit crab disturbed the scene. We were later to learn that wind velocities of 180 mph had been recorded in the area as the cyclone passed through.

The standby rig was set up in the sleeping tent, and to enable the expedition to satisfy prior requests to join some of the DX nets, checks were run to see if two stations running on the same band would cause any problems. Using the 18AVT vertical, results were as we had found in the pre-expedition tests: no cross-modulation or breakthrough was experienced on either station that was sufficient to interrupt the QSO rate of any of the stations, and from that time on three stations were running any time conditions allowed.

We had agreed that the cardinal aim of the expedition would be that every amateur who wanted to work VK9ZR would have equal opportunity, and while the beams were turned in the direction of optimum propagation, directional calls would be made only when the sheer size of the pileups made it impossible to do otherwise. An analysis of the 1978 logs had shown which areas had lost out during that expedition, and all operators were alerted to keep a special ear for those areas. The only dead period, when no propagation was possible on any band, occurred between 1600Z and 2000Z, and although a listening watch was maintained throughout those hours, only a CW rag-chew with ZK1VU resulted.

During our stay on Mellish Reef, Fernando had a bereavement in his family, and I would like to record our thanks to the operators, worldwide, who kept the channel clear while he was passing and receiving traffic back home. When the chips are down, the vast majority of amateurs prove that they are the gentlemen we assume them to be.

By the second day, we had passed the 8000 QSO mark, equipment and generators performed perfectly, the sun shone, and a swim in the lagoon was a welcome refresher. My recollection of previous expeditions gave the impression that the pileups were bigger this time than I had previously experienced, but I could be wrong. Bruce, who was taking part in his first DXpedition, handled his share like a seasoned DXer. 80- and 40-meter propagation was not as good as we had hoped; the number of QSOs on those bands was disappointingly low. Even so, every station we heard made a contact.

On the third day, we received the news that weather conditions were deteriorating; a number of dark clouds appeared in the sky, and in the evening freshening winds blew down one of the beams. No damage was done and it was quickly reerected. In the process, we discovered metal stakes buried in the sand that were from our 1978 expedition, and one of them served a second term of duty.

We passed our target of 15,000 QSOs on the fourth day and decided, in view of the rising winds and the knowledge that a cyclone was developing to the west of us, that we would close down on the following day. At daybreak we started to dismantle the sleeping tent

and gradually move the equipment back to *Banyandah*. As the day progressed, we continued to pack up until only the vertical antenna, one generator, and one rig remained. The pileup was still wide and deep as we waited for the last run from *Banyandah* to take us off. A final QSO with WA6ZWE at 0423Z, and the Mellish Reef 1982 expedition was over. Back aboard, the gear was again stowed away securely, anchors were weighed, and *Banyandah* once more picked her way through coral heads towards the open sea. Almost one hour after our final QSO, Herald's Beacon slipped below the horizon and we were setting course for Willis Island.

The team: L to R, Fernando EA8AK, Franz DJ9ZB, Harry VK2BJL, Bruce VK3DHT, and Jack KB7NW.

The second leg of our Coral Sea DXpedition was to provide the excitement of the voyage, for whilst the trip to and the operation on Mellish Reef had gone according to plan and our best expectations were realized, the homeward leg via Willis Island was menaced by Cyclone Domenic and the aftermath right up until we reached the lee of the Australian coast close to Cairns.

The course to Willis Island from Mellish Reef took us close to Magdalene Reef from whence we set a course to approach Willis Island from the southeast. To reach Willis in the forenoon, Magdalene Reef had to be passed during the hours of darkness and spot-on navigation was essential. Many anxious hours had been spent on the previous expedition peering through the darkness for breakers on a moonless night whilst listening for a 2m signal from Bill VK9ZM on which we could take a bearing. This time we had no 2m signal, but there was a waning moon.

The winds had risen to almost 40 knots after we left Mellish, *Banyandah* was lively in the rising swell, and wet tails were the order of the day as the lee rail dipped under and green seas swept into the cockpit. We were running under a reefed mainsail and peaking to 9 knots; Cyclone Domenic was only 400 miles to the east of us and we were getting the edge of its fury. At that stage it was stationary and we anxiously waited to see which way it would move.

We did not sight Magdalene Reef; Jack calculated that we had passed it 12 miles to our south when we altered course for Willis Island, and he took in more sail to make sure we did not run down on the reef in the early hours of the morning. The weather crew had promised to put on a navigation light at the top of their radio mast, but we did not see it, and Jack hove to until daylight before continuing on our course.

It was around seven in the morning when we saw the tops of the palm trees on Willis Island. As we came closer, we saw heavy seas pounding on the reef and rolling into the lagoon, and as we moved round the island to find a lee shore in which to make our approach, we could see the weather crew against the white building watching our progress as we cautiously approached the anchorage.

Jack put down two anchors for safety, unshipped the dinghy, and one by one we were transported ashore. Tony VK9ZH welcomed us on landing and introduced us to the rest of the weather-station crew: Arthur the skipper, Athol, and Jerry. We had brought mail and some urgently needed supplies, not the least of which was a replenishment of the beer and cigarette supplies for Jerry, who, in a moment of bravado, had quit smoking and consigned the remainder of his six-months supply to the ocean only to change his mind the following morning. He had spent nearly two months regretting his action whilst he waited for our arrival.

After a hearty breakfast, we each indulged in the luxury of a hot shower (the first since leaving the mainland) before we were offered a space in the operations room to set up our station. The vertical was set up on the lawn outside the main building and the beam used by Tony was put at our disposal. I opened up on 20m CW at 2316Z, several hours earlier than our anticipated arrival. Our original plan had been to stay for 48 hours, but the winds from Domenic remained steady at 40 knots and the seas were even heavier than when we arrived. The tops of the palm trees, bent over in the wind, conveyed the force of the gale.

Conditions on the air had deteriorated, too. Propagation to the east coast of the USA was poor on all bands, and to most of the USA it was only moderately good. There were a couple of short openings to Japan on six meters and a few European contacts on 80m. We explored the island while away from the rig, observing the birds nesting in the same manner we had expected to find on Mellish Reef. Willis Island is also a breeding ground of the large turtles, and the eggs that they had laid on the island were now hatching so that baby turtles were seen scuttling down to the ocean, so small that they nestled cozily in the palm of a hand.

Good rains over the past six months had made the grasses and wild flowers lush and verdant and the buttons of the yellow and violet wild flowers formed garlands around the nests of the sea birds, with their eggs or chicks. They showed no fear of us as we quietly observed them in their habitat. The rains also had replenished the weather station's water supply and the storage tanks were full.

We were impressed by the routine of the weather-station crew in their collection of weather data and dedication to the maintenance of station buildings and environs; the remoteness of their isolation was brought home even more when we saw by the visitors list that fewer than 70 people had called in the past 60 years since the station was established!

As the time of our scheduled departure approached, we watched the weather pattern over the area, hoping for a change. Domenic appeared to be weakening and moving slowly away from us, but the winds still remained a steady 40 knots and the sea was still heavy enough to make the run out to *Banyandah* a hazard.

Added to this, the run from Willis to the mainland was an obstacle course with more reefs and the narrow Grafton Passage through the Outer Barrier Reef. Flights out of Australia had already been booked, however, and Franz and Fernando would incur a heavy financial penalty if they were missed, adding to the burden of an already costly expedition. Naturally, they were anxious to leave according to schedule.

Jack, aware of our predicament, left the decision to us but nonetheless counselled caution and advised us to delay our departure by 24 hours. Arthur, with his access to so much data, consulted the meteorological center in Townsville and added his weight to Jack's advice. A delay of 24 hours would still allow flight connections to be made, but there was no guarantee that the weather would improve; it was at best a 50/50 chance. We bowed to their superior wisdom and settled down to another day of operating.

Banyandah had shifted anchorage several times during our stay when anchors dragged or the shelter of the land proved inadequate to the safety of the vessel. Once she lost an anchor which had to be dived for the next day.

When the sun rose on the morning of the 17th of May, the wind was still maintaining its velocity and we decided that we could delay no longer. All the gear was carefully sealed in plastic bags and taken down to the beach. The dinghy raced through the surf and was almost on end as it crashed through the crest of the breakers. Jack had insisted that we wear life jackets, so we were relieved when all of the crew and gear were safely aboard *Banyandah* without damage or a dunking. It took most of the day before everything was stowed away and then, when we were ready to leave, Jack discovered a fouled anchor which required a further hour to clear from the coral shelf under which it had wedged. The sun was setting when we got under way, and with a farewell wave to the group watching us from the shore, we turned our bow away from the island and into the wild seas beyond.

To clear the dangerous areas in daylight, Jack calculated the speed we should make to come up to Swain Reefs during mid-morning, but the winds pushed us along well in excess of that requirement and the light sail was shortened still further to slow us down. Sleep was difficult, but the securest way to be in those high seas was horizontally polarized in our bunks. Calmer seas brought us on deck soon after daybreak, however, and we were in the lee of Swain Reefs. Inside the line of breakers to our north and extending to the horizon, the coral heads loomed dark beneath the surface, picked out by the sandy bottom reflecting through emerald water. On our last trip, there had been a Taiwanese fishing boat high on the submerged coral, her bottom ripped out by the jagged spurs, but like the wreck on Samauriz, there was no trace of her either.

In the calm lee of the reef we dropped anchor and had a hearty breakfast. We had gained several hours on the run from Willis Island and the wind had still not abated. Weather reports were coming in that a change was on the way—that Cyclone Domenic had moved still further east and was dying out. By delaying our departure from Swain Reefs for several hours, *Banyandah* would see the lighthouse on Euston Reef (marking the southern side of the Grafton Passage through the Barrier Reef) in the early morning of the 19th.

Leaving Swain Reefs, we were now moving into the lanes of north- and southbound shipping along the Australian coast, standing well clear of the mighty Great Barrier Reef. Several ships were sighted as we continued our homeward leg and, as Jack had predicted, we sailed past the Grafton light early in the morning. We were awed by the fearsome seas that pounded over the reef, which stretched away to the south as far as the eye could see. We were six hours away from Cairns now; soon Green Island was clearly visible on our starboard bow, and then came the outline of the coastal mountains and the channel leading to Cairns harbor. The harbor master allocated us a berth alongside the main cargo quay; lines went ashore, and with *Banyandah* secured, we relaxed into an emotional scene of mutual congratulations.

Several hours later we saw Franz and Fernando off to the airport; Ray VK2BKD was to meet them in Sydney and entertain them until their homeward flights. Bruce and I stayed on another day unloading the equipment and arranging its shipment down to Sydney, and the following day we flew down to Brisbane, collected our car, and began the long drive back to Sydney. A sack full of QSL cards had preceded us, and now began the long task of checking logs and preparing a QSL card suitable to the occasion.

Between Mellish Reef and Willis Island we had made over 20,000 QSOs to 132 countries on all continents, we had enjoyed the comradeship of a team of operators under difficult and hazardous conditions, and we resolved to undertake another expedition together sometime in the future. ■

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How to Gain with PVC

This could be history's cheapest quad. Try water pipe on 2m.

To find out why I need a very portable, high-gain 2-meter antenna, first you must understand a bit of both ancient and recent California history.

About 15 million years ago (an extremely short while, geologically speaking), the Earth groaned and shuddered; huge rock plates cracked together, and the spiny hills known as the Sierra Nevada started to rise 20 to 30 thousand feet into the air. Huge volcanoes resulted from this immense pressure and uplifting, and these 30,000-foot peaks belched smoke and lava, breaking themselves into smaller hills (like Mt. Whitney, "only" 14,000 feet high) and deep valleys, which in time became huge lakes. Lake Tahoe, 6000 feet high and unknown thousands of feet deep, is the result of one of these huge cindercones blowing its top and then collapsing back in upon itself, a classic case of a mountain lake surrounded by peaks many thousands of feet high.

At about this time, Tehama, one of the minor volcanoes of the range, also ex-

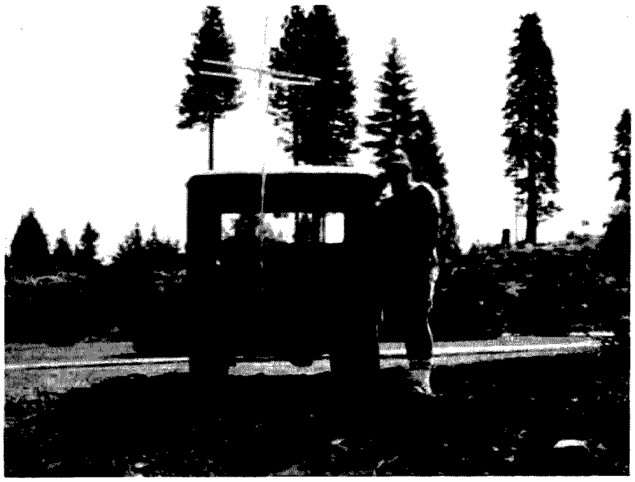

Photo A. The author, with quad mounted on the jeep.

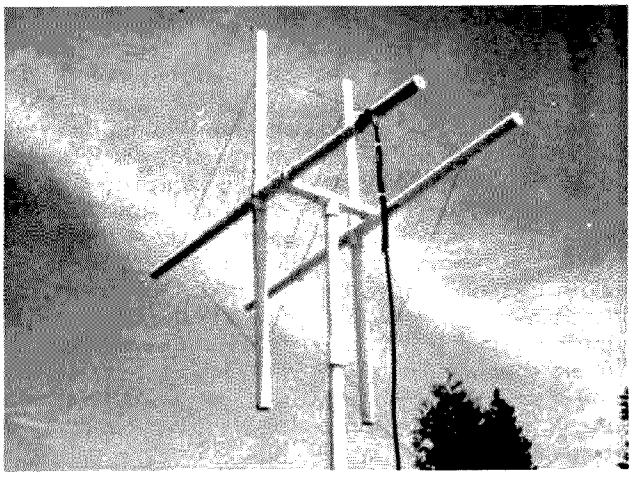

Photo B. The quad in assembled form.

Photo C. The balun attached to the quad driven element.

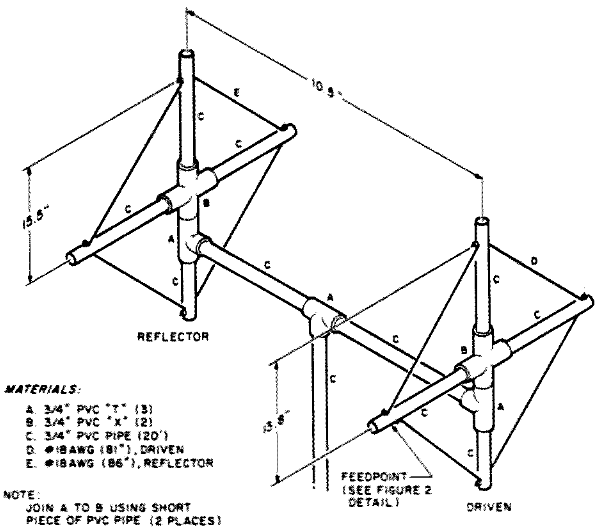

Fig. 1(a). PVC quad.

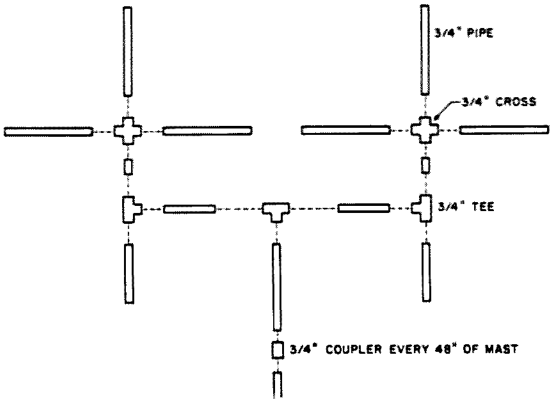

Fig. 1(b). PVC assembly.

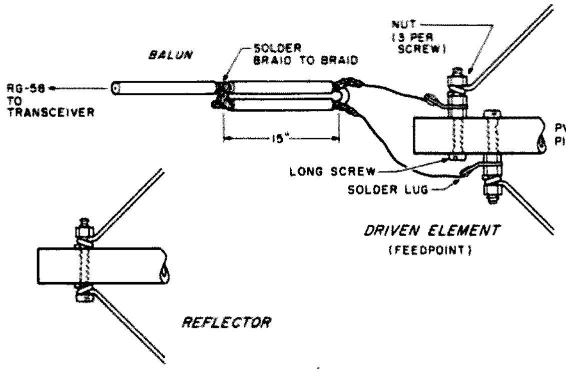

Fig. 2. Feedpoint and balun detail.

ploded, creating a secondary volcano called Mt. Lassen. In the process, a deep lake surrounded by peaks, called Lake Almanor, was formed. Later, about a million or so years ago, an earthquake created a crack in the hills surrounding Almanor. The escaping water created the Feather River and its deep canyon.

Now for more recent history. A couple of years ago, a local group of pilots decided to hold a rather unique air race. Instead of merely the fastest being the best, this group decided to award a trophy to the airplane that hauled the biggest load on the least fuel the fastest. They called this 400-mile race the "Competition for Aircraft Fuel Efficiency," since shortened to the CAFE 400.

All of which brings us to the present day. One of the checkpoints in the race is an island in Lake Almanor, and the race folks wanted reports from Almanor back to race headquarters in the Sonoma Valley, some one hundred fifty miles away, preferably on 2 meters. In case you don't get the picture yet, let me paint it in vivid colors: Here I sit on an island in the middle of a lake, surrounded by hills 3 to 4 thousand feet high in every direction, with no ac power, no telephone, and a mission to communicate via 2 meters to another station 150 miles away, which is further tucked into another valley blocked by another mountain range 4500 feet high!

Fortunately, this deck has 3 aces and I drew them all. First, there is a little knoll on this island that will get me up 500 feet above the lake. Second, the Feather River Canyon, although only half a mile wide, is 3000 feet deep, 40 miles long, and pointed directly at Sonoma. Third, Sonoma has a 2-meter repeater on one of those 4500-foot peaks just outside of town.

And the ace up my sleeve (without which we would have lost the game) is my portable quad antenna. 50 Watts and a vertical dipole bought us absolutely nothing, but with the quad antenna described below, signals were Q5 both to and from the lake. See Photo A.

There were some specifications on this quad, though, that made it rather unique. First of all, the entire antenna and mast needed to be disassembled and packed into a bundle of sticks no longer than a meter and a quarter (48"), a size suitable for backpacking (if necessary) a considerable distance. Second, it needed to be put together in 15 minutes or less. Third, of course, it needed to be cheap, cheap, cheap. See Photo E.

I decided to make the entire antenna-supporting structure from 2-cm (3/4") polyvinylchloride (PVC) water pipe and fittings. Photo B shows the general construction details, and Figs. 1 and 2 show construction details of the quad. In working with PVC fittings, I found that the fittings were all tapered, with the result that if the pipe was inserted firmly into the fitting, the assembly was rigid enough to stay together without the use of pins, glue, or keepers of any sort. Furthermore, the joint so made is rotatable with a bit of elbow grease. This allows the quad to go from horizontal to vertical polarization (and anywhere in between to allow for polarization-rotation bounce off the canyon walls) in a few seconds time.

For those of you who have never done any aviation antenna work, the balun shown in Photo C and Fig. 2 may appear strange. Note that the center conductor of the coax does not attach to *anything* at the antenna end, and that the antenna is connected to only the shield braid of the coax. The loss, though, is about 0.1 dB, the balance is near perfect, and the transformation ratio is 1:1. (Note also that this scheme grounds both elements when this balun is used on a dipole—affording cheap and automatic lightning protection.) The balun fastens to the quad element by means of solder lugs. Photo D also shows that the balun is firmly laced to the PVC frame; if the balun is not supported, the coax braid will break at the solder lugs.

The quad elements themselves are AWG 18 wire.

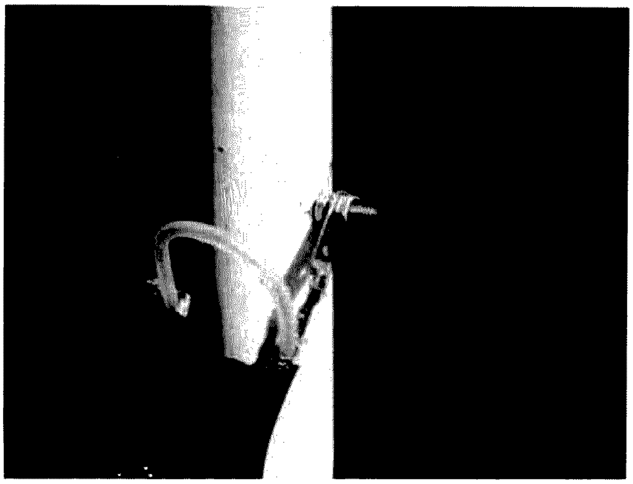

Photo D. A closeup of the balun attach point.

Photo E. The quad disassembled into a box of fittings and a pack of sticks.

There is nothing sacred about this size; my company uses rolls and rolls of the stuff, so I got it off the shelf. AWG 18 gave us a 1.5:1 vswr bandwidth of about 3 MHz. If you need more bandwidth, use heavier wire.

The proof of any antenna is its gain. While I have not been able to sniggle any free time on the company antenna range for this product, a bit of field testing using a calibrated Kenwood TR-7400 shows the gain of this quad to be between 6 and 8 dB above a reference dipole. The most repeatable measurement indicates a gain of 6.5 dBd. There are many narrow, deep nulls on the backside of the quad, so that a true front-back ratio is hard to define. I *can* comment that a machine in Reno that was giving me fits at Almanor completely disappeared into a null that was measured later in excess of 30 dB. The main beam is fairly wide; eyeball measurements show the 3-dB forward beamwidth to be about 30 degrees wide.

Many thanks to Ron N6AUB and Grover KC7IW for their help in field testing. Also many thanks to the ghost of Mt. Tehama, whose explosion created the need for this antenna. ■

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Helicoids

Few people understand how to build these versatile whips. This article takes care of all the ifs, ends, and butts.

When first employed as a tech rep, I found myself on the move quite often and had a definite need for a portable antenna. I figured that I could kill two birds with one stone and rig up something that I could use in both my job and my hobby, amateur radio.

Sometime in the past, I experimented with a ground-plane antenna utilizing expandable and retractable whips which when simply adjusted to the correct lengths permitted operation on the frequency of choice. Some of you ex-bush monkeys from Southeast Asia ought to remember the 292 ground-plane antenna—a beast to lug around the boonies. Well, at the time, I was trying to come up with a smaller package.

In any case, with that old idea in mind, I decided to try out the same principle in conjunction with helicoidal-type antennas. The main problem was in obtaining a quick disconnect to join the heli form to the whips.

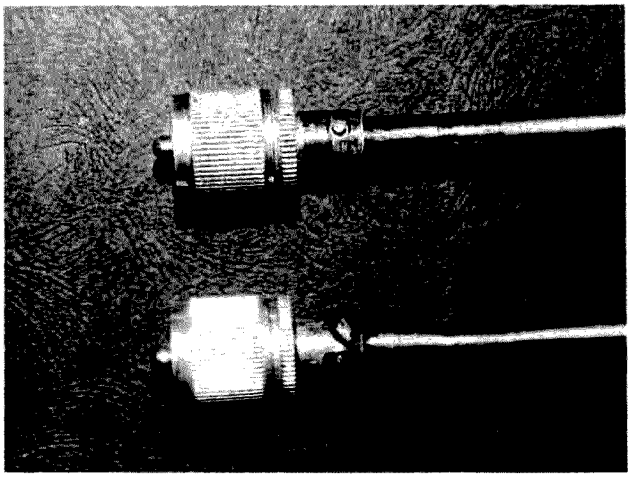
After much fooling around and wasted effort, I decided to use the UHF-type connectors with a barrel in the heli forms and a PL-259/U-type connector on the whip. This called for a much larger heli form which resulted in the antenna being able to handle 500 Watts or more for power with the connectors providing a good solid rf connection.

All in all, it resulted in an antenna that was capable of being used on 21 MHz through 30 MHz with a 500-Watt capability. With the heli form being the largest element in the package (25½ inches), the antenna was what I called suitcase compatible.

Basic Fundamentals

The use of expandable and retractable whips as capacitance hats helps prove the saying that every little bit helps. The elements also radiate and by virtue of their length provide more capture area for the received signal.

According to the formula for resonance, the frequency is inversely proportional to the square root of either L or C; changing either one would result in a frequency shift. If an inductance value could be found that was compatible with the capaci-



Harada whips joined with the UG-273/U connectors.

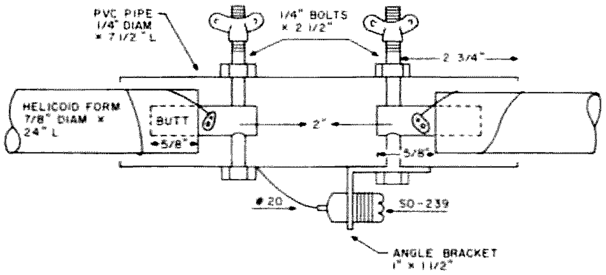


Fig. 1. Both helicoids mounted within the PVC pipe mount. The two wing nuts are used for mounting to the phenolic mast mount.

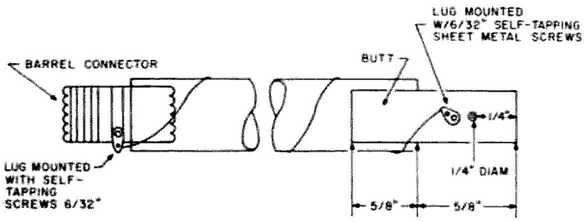


Fig. 2. The tip and end of the helicoid with the barrel and butt epoxied in place.

tance value of the whips, then tuning over a specified range of frequencies would be possible.

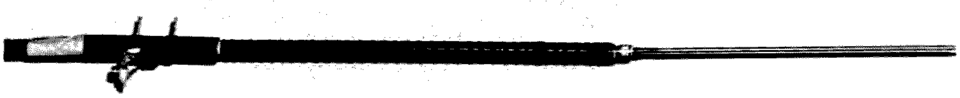
Armed with that basic research, a suitable induction value was determined by empirical design and found to be compatible with the formulas for induction and the number of turns for a closely-wound coil.

With this, I now had a base frequency to start with. Simply expanding or retracting the whip elements should permit me to tune up to the next highest frequency; a grid-dip meter told me my base frequency was 21 MHz and (much to my surprise and delight) informed me that I could tune on up through 30 MHz.

In any case, before you start construction, let's be realistic: This antenna is not going to compete with any beam or dipole 100 feet up in the air, although I have given some reasonable competition (by logging in 48 countries with these antennas). There is one thing that is certain: You will be able to get a good signal out in what I term a hostile environment.

You will need two sets of whips; I purchased mine from Harada Industries of America for \$3.95 each. They are perfect for this application in that they are solidly constructed, are of stainless material, and expand out to approximately 50½ inches. The model number is ST-13 (3TS-1300F) and they are available at most auto supply houses.

I needed two additional sets of whips for the 28-MHz-through-30-MHz band, as I didn't want to cut the Haradas—their full length was needed when using the antenna in the vertical configuration. So I used two sets of the conventional type used for FM radio (consisting of three sections, each section 7¾ inches long); these are good as they make good electrical connections when expanded and shortened and give you the frequencies needed if you are concerned with any commercial activities. In any case, I picked up a couple of them in a shopping mall for two bucks.



Antenna used as a vertical with the ground side of the helicoid replaced with a radial.

Assembly

Take the two barrel connectors prepared as in Fig. 2 and mount a terminal lug over the 6/32-inch hole; tighten down with a metal screw. Do the same thing with the brass butts.

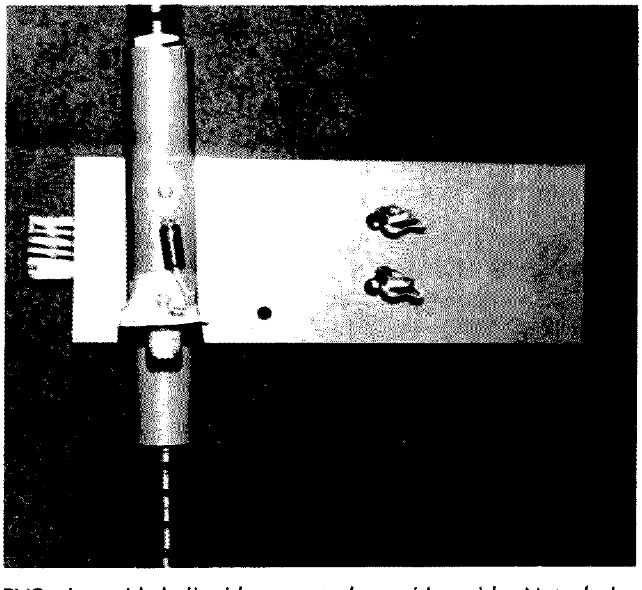
Obtain the two helicoid forms (7/8-inch diameter × 24 inches long); insert the barrel connectors into the form right up to the lug. Using 5-minute epoxy, seal the connectors to the form; repeat with the butts, making sure that their ¼-inch hole is left on the outside.

If the butts and connectors do not conform to the inner diameter of your form, you may have to file the connectors down or wedge them in place. Make sure that you have good solid straight connections.

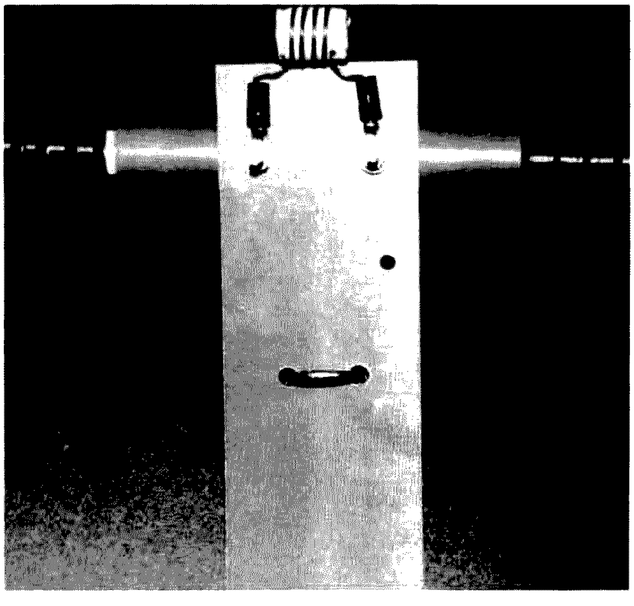
Measure down from the lip of the form on the barrel connector side 4-3/8 inches and scribe a mark; this will be the beginning of the loading coil winding which is simply an extension of the helicoid wire.

Take 133 inches of #20 enameled wire and solder one end to one of the butts. Begin your winding right on the edge of the form, maintaining a ½-inch pitch winding for 16 turns and then a ¾-inch winding pitch until you reach the loading coil mark.

At this point, I suggest taping the winding to keep it in place. Start winding 7 turns close-wound as tightly as possible; on the last turn, I would again use tape to maintain the coils' integrity. Continue the windings up the rest of the form with ½-inch spacing and solder in place.



PVC pipe with helicoids mounted on either side. Note hole used for tilted dipole.



Matching coil mounted on the butt bolts.

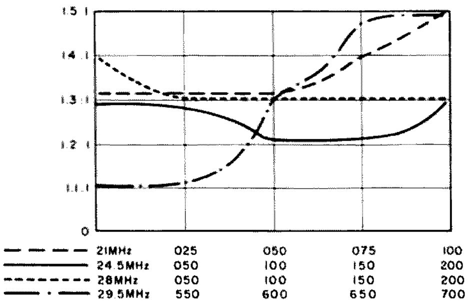


Fig. 3. Swr curve for antenna used in the dipole configuration and set up 15 feet above ground. Refer to the text for whip lengths.

You will have to do exactly the same thing with the second heli form, taking care that the winding follows the same axis as the winding of the first form (see Fig. 1).

At this time, I had to prepare the UG-273/U connectors, 4 for each of the whips. I had to break away and remove the plastic that was around the center pin to ensure that when I filled the BNC side with solder, the center pin would be shorted to the main or ground side of the connector's housing.

You should at this time make sure that the inside of the BNC side of the UHF connector is completely clean, as well as the end of the whip which will be inserted into it. Fill the BNC side with hot solder and insert the whip end into it, making sure that you have a good straight connection. When it is cooled, check with an ohmmeter and make sure that the whip, the main housing of the connector, and the center pin are one connection, as this will mate with the barrel connector on the helicoid form.

When I was trying to match up the 50-Ohm coax with the heli dipole, I experienced some problems. At first, I simply hooked the coax directly to the dipole; this would have worked, but I was not entirely satisfied with the swr. I then went to a 7-turn coil shunted directly across the two bolts that held the helicoids to the mast plate. This brought me into an acceptable range, but when I put the swr meter directly into the antenna, my swr was something other than what it should have been. Back to the drawing board.

I finally ended up with a coil with the exact same dimensions as the helicoid; in fact, I used a leftover piece from it. The form is 1 inch long. Approximately 1/8 inch in from each end, I drilled a 3/32-inch-diameter hole. I then wound 4 turns of #20 enameled wire (same that is used on the heli form) and left 2-inch pigtails. (Before I forget, the windings are spaced 1/8 inch apart; the two pigtails are then terminated with ¼-inch spade lugs and the whole affair is smeared with 5-minute epoxy to keep the coils in place and give protection from the elements.) This brought the swr at the antenna input practically down to a flat response with good power output; also, the coil seems to alleviate somewhat the problems of nearby objects having an effect on resonance.

I used a phenolic plate for my mast mount. I took a piece 3½ inches wide by 8 inches long by ¼ inch in thickness. Two inches in from one end, I drilled two holes to match the two bolts that come out of the PVC pipe mount. When the plate is mounted over the bolts, it makes an ideal place in which to mount the coil. About 3 inches down from that, I drilled two more holes for the single U-bolt that would hold the whole affair to some kind of mast.

Last but not least was the PVC pipe mount to hold the helicoid forms. I experienced some problems with this because with the wire on the heli forms there was not sufficient room to insert them into the pipe. I simply took a rasp file and filed down the inner diameter on each side of the pipe to provide a secure fit for the heli forms. When you drill the two 2-inch-spaced holes in the pipe, make sure that they are exactly parallel so as to properly align the butts of the heli.

Take one heli form and insert it into the PVC pipe, aligning the butt hole with the hole in the pipe. Take the SO-239 mounted on the bracket and insert the ¼-inch bolt through it into the PVC pipe, on through the butt, and out the other side of the pipe. Tighten it down with a nut and mount the other heli form on the other side in the same manner. Solder a 2-inch piece of #20 wire to the center pin of the SO-239 and terminate the wire with a ¼-inch spade lug. Take the lug and insert it beneath the second heli bolt and tighten it down. This completes the construction of the antenna.

I would recommend tapping the holes for the butts. I didn't have any taps available at the time and I force-fitted the bolts through the brass butts, making my own threads with little difficulty.

At this point, you should have the phenolic plate mounted and the coil secured with the two wing nuts; connect the two Harada whips to the ends of the helicoid.

Testing

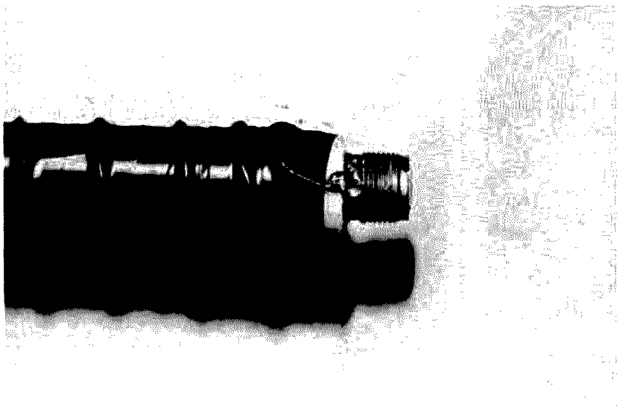
We will not refer to the first section of the whip for adjustments—only the 2nd and the tip "end."

Connect the RG-8/U mini coax; I used 32 feet because that was all I had left and I found it sufficient for my needs.

Adjust the 2nd section for 9½ inches, the tip extended. You can start your checking at a height of 5 feet or 15 feet, whichever is practical for you.

Apply just enough power from the transmitter to establish an swr ratio. It should be rather small. Apply power and the swr should approximate the one in Fig. 3. I used 100 Watts into the antenna. If the swr isn't satisfactory, check the dial of the transmitter and test at a high and low end to determine the whip length.

For instance, if your swr is minimum at 300 kHz and you want, say 50 kHz, extend the whip length about one inch at a time and recheck. I used high-voltage fuse pullers 16 inches long. With a companion for safety and much reduced power, I simply adjusted right in for



Barrel connector mounted on the end of the helicoid.

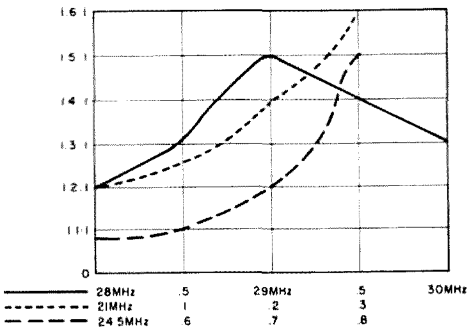


Fig. 4. Swr curve for one section used as a vertical. Readings were taken at a height of 10 feet. Refer to the text for whip and radial lengths.

minimum swr. I wouldn't use this method unless highly-trained personnel who know how to react in the event of an emergency are present.

For the 24.5-MHz band, adjust the whip's 2nd section to 3 inches and the tip to 7½ inches; apply the same technique.

For 28 MHz on up, use the FM whips. On 28 MHz, the whip is adjusted for a total length of 19½ inches, using each section.

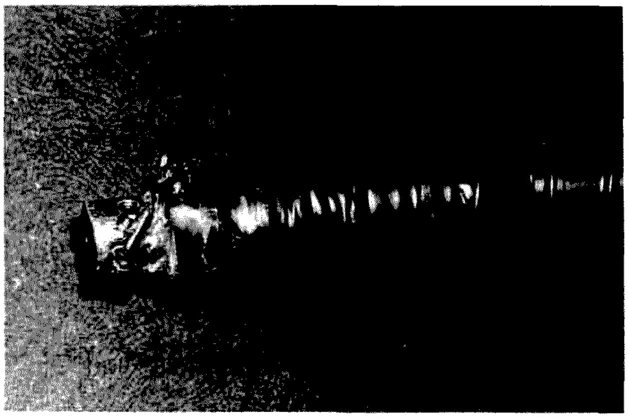
For 29.5 MHz, adjust the whip for a length of 15 inches.

Testing for the Vertical Mode

If you say that you don't have enough room to get a heli dipole up in the air, how about a short vertical with one radial ("Great shades of Marconi!"), perhaps mounted on a camera tripod about 3 or 4 feet high, in the living room, out in the yard, or perhaps up in the air about 40 feet?

Well, just remove one heli form from the ground side and make sure to replace the bracket with connector, bolt, and wing nut which will be used to secure the radial.

Hook up the RG-59/U coax (I used 50 feet) and don't forget one Harada whip extended all the way. Connect one radial (10 feet long, about #14 vinyl-jacketed wire) to the wing nut and apply power at 21 MHz. Your swr should approximate the one in Fig. 4. Just let the radial do its thing, lying along the ground or hanging beside the mast. If you find that adjustment is necessary, adjust the radial about ¼ inch at a clip, but tried and proven events dictate that this shouldn't be necessary.


Brass butt mounted in the helicoid form. Note the threaded hole for rf connector with a ¼-inch bolt.

On the 24.5-MHz band, adjust the Harada 2nd section to 6 inches, the tip to 7½ inches, and the radial to 9 feet, 6-3/8 inches.

For 28 MHz through 29.5 MHz, adjust the tip only to 6 inches and the radial for 7 feet, ½ inch.

You may want to do as I have done and make up some stubs with phone jacks so that removing one stub will permit resonance on the next highest frequency. This alleviates the problem of carrying around a complete set of radials.

A good swr meter and a noise bridge are really essential for testing. This completes the test for the vertical mode.

Conclusion

You shouldn't experience any difficulty in, obtaining resonance with this antenna. I primarily set up all parameters in the low ends of the bands so that there is ample adjustment left to permit operation in your favorite portion of the band.

The swr is sufficiently low so that if I feel like working some SSB, I leave my little Kenwood AT 130 antenna tuner in the line and just touch up a little bit, leaving a complete flat response.

It is a fun antenna to work with, especially when there are 10-meter band openings. I also found it useful for instructional purposes. Being compact, it lends itself to a classroom nicely; a student can have hands-on application in adjusting for resonance, observing swr power relationships, and even trimming the radials.

Most of the parts used in the construction may be substituted for, such as the material for the heli form, the PVC pipe mount, and the coax connectors. You even may want to operate in just one favorite portion of your ideal band. If so, you may replace the whips with something more permanent, such as a piece of brass welding rod or a section of mobile whip antenna. You then will just have to find the correct resonant length for that band.

I have heard a lot of pros and cons with regard to short antennas, ground losses, crunching effect, etc. But I for one have had a lot of fun pursuing my hobby where otherwise I may not have been able to do so.

I would like to make one last comment on the design: The loading coil that I selected is at best a compromise. I could have selected a coil for each band and made the swr as tight as a drum, but this would have entailed changing coils for each band; accomplishing this in the evening, perhaps in the dark, would present problems (dropping a nut, coil, etc.). Changing a whip presented no problem as to selecting the proper length, especially if the elements are grooved so one can touch-sense the correct length for the desired band. In any event, at this time the swr is sufficient for typical operation.

Anyway, some of you antenna buffs should be getting some ideas about a compact beam, maybe a reflector 5% longer with extra optimized spacing. Who knows, it may work.

For you apartment dwellers, you may want to hang the vertical out over the balustrade and put a flag on the end of it.

The most classical approach I have ever seen was undertaken by a friend of mine. He took one of my verticals and had it mounted inside a 2-inch-diameter-by-30-foot piece of PVC pipe; he then mounted a coax connector at the base and just let the radial hang within the pipe. To top things off (as the old saying goes), he then constructed a model TV antenna, spray-painted it with silver paint, and mounted it on top of the pipe to justify the pipe's presence. With that, I'll have to say good luck and 73. ■

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The Big-Car Break-Down Beam

Try two-meter luxury the easy way.

Involvement with the local RACES/ARES organization (the Radio Amateur Civil Emergency Service/Amateur Radio Emergency Service) prompted a search for a quick-setup beam antenna to enhance two-meter communications when operating from a vehicle at a fixed location. This article describes the beam, mast, and guying that I came up with. The assembly is called "The Four-Minute Beam" because it can be set up by one person in less than four minutes. For two people working together, it's a piece of cake.

The beam selected was a Cushcraft A147-4, a four-element yagi with a boom length of 44" and a weight of only two pounds. The design of this model is ideally suited for the application. It was necessary only to replace the hex nuts with wing nuts to make it a knock-down, quick-assembly beam and add a stack of spacing washers to allow the mounting U-bolt to be pulled up snugly around the small diameter mast. The disassembled beam is stowed in the original shipping carton modified to become a storage box.

The twelve-foot mast is made up of four pieces of telescoping .058"-wall aluminum tubing. The largest is 1-1/8" in diameter, and the longest piece is cut to a length of 56½". The four pieces telescoped are then stowed in the storage box.

Construction of the mast consisted merely of cutting the pieces to length and making a longitudinal hacksaw cut in the ends of three of them. See Table 1.

A small hole (about 1/16") is drilled 14" from the bottom end of the 3/4" piece to provide an indication of the proper extension of the top section when the mast is erected. A stripe of paint or nail polish is easier to recognize, but the hole remains as a reference if the stripe is scraped off as the sections are telescoped.

The stainless-steel hose clamps around the slots in the three outside pieces are used to clamp the sections of the mast together when extended and also to keep them from sliding apart

Photos by Jim King WB3JZI

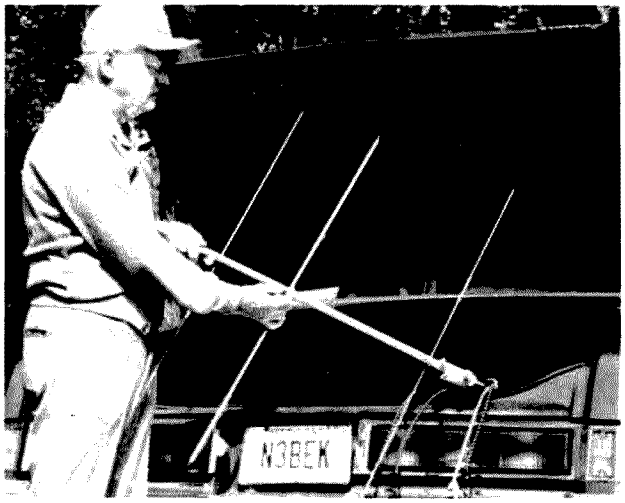

Photo A. Beam being assembled with wing nuts. No tools required.

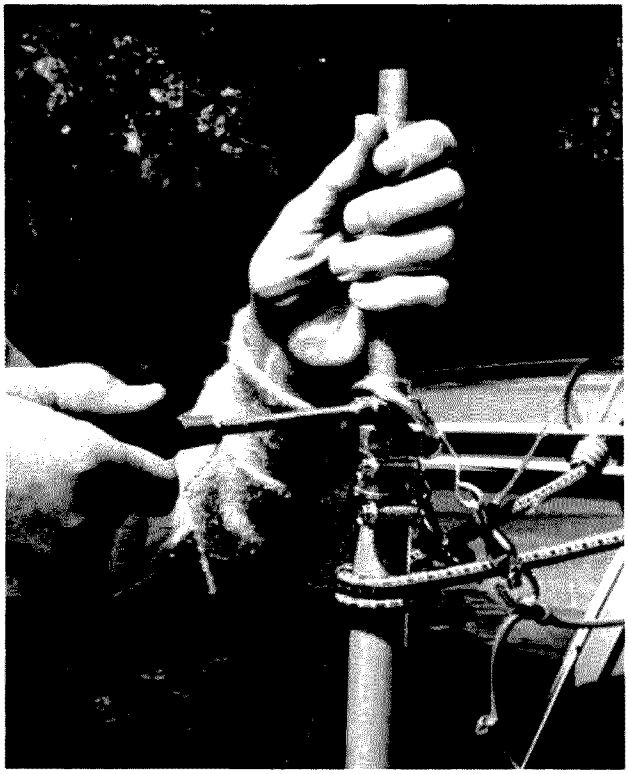
Photo B. Telescoped mast secured to car. Photo shows hose clamps and guy-line details. Mast is ready for installation of beam.

Photo C. Beam and transmission line installed; mast being extended.

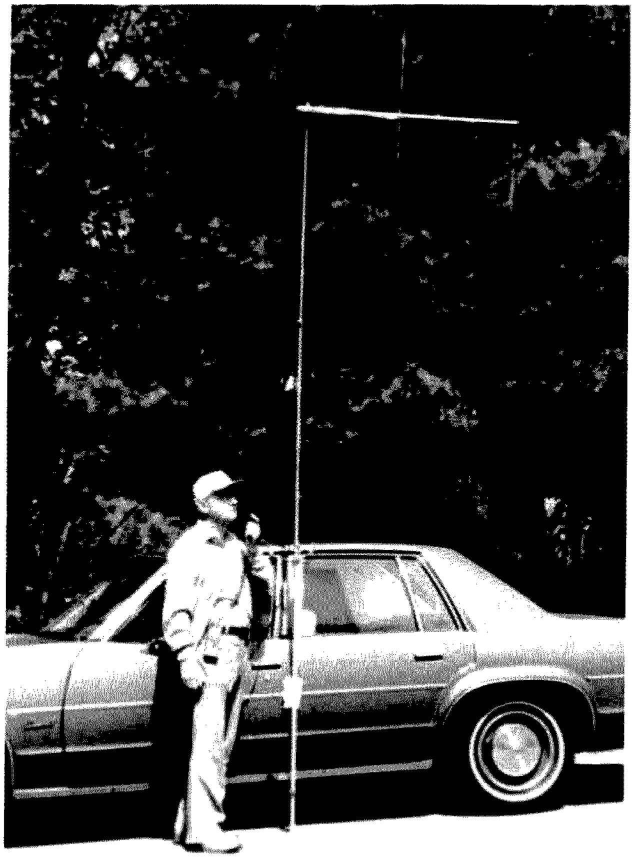

Photo D. Mast fully extended. Beam being used with HT.

while being handled. The 1-1/8" piece acts as a stiffener for the bottom section and also allows the beam to be rotated and clamped in the desired direction.

In operation, the mast is secured to the side of the automobile with stretch cords (bungees) with the bottom section resting on the ground. One cord is hooked under the frame, and a second one is hooked to the roof gutter. Two parachute-cord guys are snapped into a hardware ring which is slipped over the top hose clamp. The loose ring allows the mast to be rotated within the bottom outside section of tubing to aim the beam. The guys are secured to the opposite side of the automobile by stretch cords hooked into loops in the guys at one end and under the fenders at the other.

The storage box was made by removing all the staples on the side and end flaps of the antenna shipping carton. The corners were reinforced with pieces of cardboard and the ends were closed with duct tape. The carton is thus converted to a long box with a hinged top cover. The box can be kept closed with a large rubber band around each end.

Setup Procedure

The following procedure has been worked out for mounting the beam and erecting the mast on a 1977 Oldsmobile Delta 88.

Prior to field operation, the mast should be erected without the beam to adjust the length of the guys. (See "Field Operation," below.) With the mast extended so that there is a 10" overlap of the first and second sections (the first section consists of the 1-1/8" and 1" pieces telescoped) and the top section is extended to just uncover the market hole (mast height 12 ft.), fasten each guy to a 35" stretch cord and hook one cord on each fender on the side of the auto opposite to the mast.

The rear guy should be hooked at the rear of the wheel to let the guy clear the rear door. Adjust the length of the guys to provide snug guying but not so as to bend the mast. For future rapid setup in the field, tie an overhand knot in a bight in the cords to provide a fixed loop to take the hooks on the stretch cords. Tie a recognizable knot or otherwise mark one cord to distinguish which cord goes to which fender.

Field Operation

1) Remove the telescoped mast, the stretch cords, and guy lines from the storage box. Hold the telescoped mast vertically against the side of the auto in the space between the doors (a stiff section of the frame as opposed to the more flexible door panels). A cloth pad between the mast and the side of the car will protect the finish. Near the bottom, take one turn with the short stretch cord around the mast and hook it onto the underside of the frame. Take one turn around the top of the first section of the mast with one of the long stretch cords and hook it onto the roof gutter. The mast will now be held firmly against the side of the car. The cords are just the right length for the Delta 88, but different lengths may be required for other models.

2) Loosen the top two hose clamps. Slide the hard-

Piece	Diameter	Length	End Slot
1	1-1/8"	53"	1"
2	1"	55"	1"
3	7/8"	56"	1"
4	3/4"	56½"	none

Table 1.

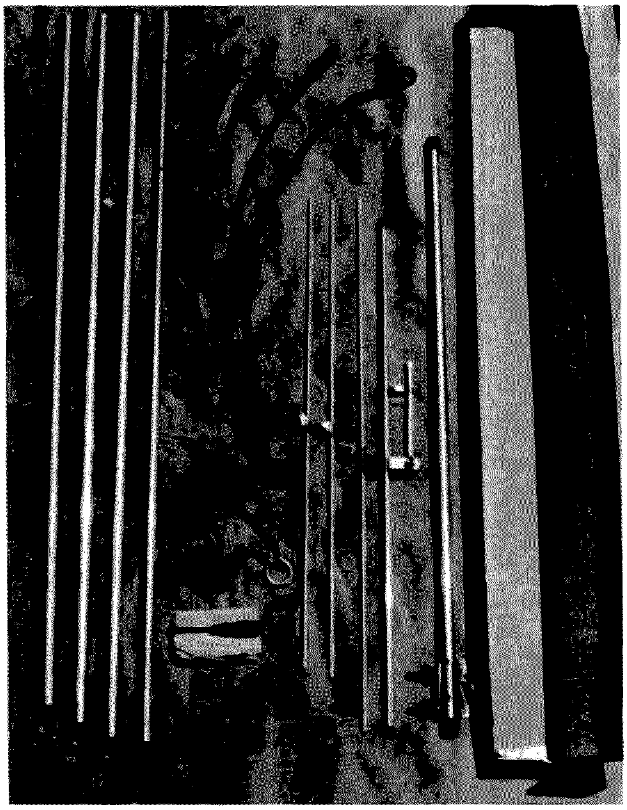

Photo E. Pictorial parts "list." (See Parts List.) The box on right is storage box made from the beam antenna shipping carton.

Parts List

1	Cushcraft A147-4, 4-element, 2-meter antenna
4	8-32 wing nuts
2	1/4" wing nuts
10	flat washers for 1/4" U-bolt (about 5/16" spacer on each leg of U-bolt)
4	6-ft. lengths, .058"-wall, 6061-T6 aluminum tubing (see Table 1)
3	stainless-steel hose clamps
1	1-1/2" hardware ring
2	small snap hooks, size to fit hardware ring
2	nylon parachute cords or other small lines about 12 ft. long (cord smaller than about 3/16" is not convenient to handle during mast erection)
3	stretch cords with hooks, overall length 35" to ends of hooks*
1	stretch cord with hooks, overall length 28" to ends of hooks*
1	wood base, approximately 3" x 6" x 5/8" thick (for mast base on unpaved surface)
Tool	spin-tite or end-wrench to fit hose clamps

Total weight in storage box—7¾ lb.

*These are standard sizes at the local hardware store.

ware ring over the top section of the mast Fasten both hooks onto the ring and throw the two guy lines over the roof of the car. Raise the top mast section about a foot and secure it by tightening the hose clamp.

3) Remove the antenna boom and elements from the storage box and assemble them. Mount the antenna on the top section of the mast and snug the U-bolt by tightening the wing nuts. Connect the coax transmission line to the antenna.

4) Raise the top section of the mast to just uncover the marking hole and fasten it securely by tightening the hose clamp.

5) Extend the middle section so the total height is about ten feet. *Hold the middle section up firmly with one hand and fully tighten the hose clamp. Stand so as to not be under the antenna.* Hook the two remaining stretch cords to the guys and hook the cords under the fenders. While holding the middle section with one hand, carefully extend it until the two guys are pulled up taut but not so as to bend the mast. *Tighten the hose clamp fully.*

6) Loosen the hose clamp at the bottom—the one around the 1-1/8" bottom tube. Aim the antenna in the desired direction by rotating the mast within the 1-1/8" section. Tighten the hose clamp.

7) Pass the coax feedline from the antenna into the car and plug it into the two-meter rig.

You're in business.

CAUTION: Do not erect the mast in any location where it could possibly contact electric wires. Use care when handling the mast with the beam installed. If the sections inadvertently telescope, the antenna elements can become lethal spears.

To take the antenna installation down, hold the mast section being lowered *firmly in one hand*, loosen the hose clamp on that section, and then ease *it down with both hands*. Do not let the elements hit into the car roof—very hard on the finish.

The installation described is stable and adequate for limited periods in moderate weather. The erected mast could be strengthened for a longer stay in windy weather by adding a third guy opposite the other two, tied to a cinder block.

One disadvantage of this setup is that when in place, neither door on one side of the car can be opened. This makes it awkward for two people in the front seat. It will probably be most convenient to mount the mast on the driver's side and use the opposite side as the operating position. It is also not convenient to rotate the mast from inside the car. However, the four-element beam has a broad lobe, so it need not be pointed precisely.

Performance

With nothing resembling an antenna range or controlled field-strength measurements, an attempt has been made to compare the performance of the beam with that of a 5/8-wavelength mag-mount roof antenna. The equipment used consisted of an Azden PCS-3000 FM transceiver and a coax antenna switch to allow rapid antenna transfer. The PCS-3000 has an LED S-meter. In order to obtain comparative measurements, the incremental signal strength in dB was predetermined for each of the LEDs.

The signal from several repeaters indicated a beam gain of from 10 to 12 dB over the rooftop antenna. One distant repeater that could not be heard on the rooftop antenna was activated with the beam. A simplex test with a station 17 miles distant indicated approximately a 10-dB advantage for the beam on both transmit and receive. With five Watts of output, the signal at the distant station was reported weak and noisy. With the beam, the report was "solid, noise-free copy."

The mast and beam arrangement has proven to be a convenient means of quickly making a significant improvement in communications performance from an automobile in a fixed location.■

Simple Parabolic Theory

With a little bit of math—presented here—you can understand, design, build, and enjoy these effective antennas. Hopefully.

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In the near future, radio amateurs will be exploring new horizons that will dramatically enlarge the panorama of our radio activities. High-altitude satellites and frequencies above 1 GHz will be used along with very sophisticated transmitting modes. In contrast, most radio amateurs are reluctant to undertake any project at frequencies above VHF, mostly because of lack of easy-to-read literature. This article is intended to clarify some concepts on parabolic antennas, to help in filling the gap in this area.

The subject is centered on the theory of parabolas and their behavior. The design of reflectors is discussed with a minimum of mathematical implication.

What Is a Parabola?

The parabola (paraboloid of revolution) is a curve that theoretically is generated by a point which moves in such a way that its distance from a fixed point, called the focus, always equals its distance from a fixed line, called the directrix. In Fig. 1, D-D′ is the imaginary line called the directrix. C-C′ is the axis of the parabola; it is perpendicular to the directrix. The moving point is P′. If E-P′ = P′-F for any position of P′, then P′ is moving along a parabolic curve. P is midway between directrix D-D′ and focus point F.

If the parabola is rotated around its axis, a surface called the surface of revolution is produced. The same properties of the paraboloid of revolution apply for all the surface of revolution, because of symmetry.

Energy Reflection

It is important to know how reflection is produced in a plane in order to understand how the parabolic antenna works. In the next paragraph, I'll explain how the reflection of a light beam is produced. The same criterion should be employed when the energy source is a radio antenna.

In Fig. 2, you see a light beam that is aimed against a polished surface (like a mirror) from point O to point B. The beam will reach point B with an incidence angle α. A reflection B-A will be produced and reflection angle β will be equal to incidence angle α.

Similarly, in a parabola (see Fig. 1), if a tangent to the curve is drawn at any point P1, then the angle α equals angle β. Thus, if a source of energy is placed at focus point F, its beam is reflected by the parabola surface at point P1 in the direction P1-L. Since P1-L is perpendicular to D-D′, it is also parallel to axis C-C′. The same is valid for all points in the parabola. Thus, a sharp directional beam may be

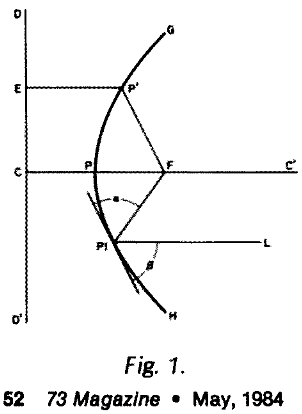

Fig. 1.

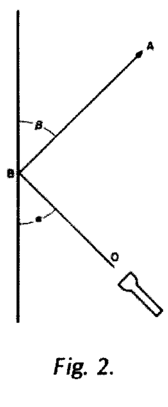

Fig. 2.

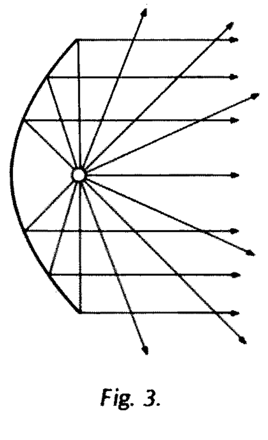

Fig. 3.

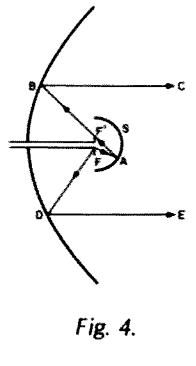

Fig. 4.

obtained from a small nondirectional source. But besides the reflected beam, there is also present a diverging beam radiated directly from the source. See Fig. 3. Hence, the resultant wave has considerable scattering unless the source is made directional.

You should be aware that the theoretical source point has no physical dimensions but is spherical in essence. And that a dipole is generally used in practical parabolics and obviously not all parts of the dipole are at focus although most radiation is produced at its center. Thus, defocusing is minimized. The higher the frequency, the smaller the feeding and the better the focusing.

Second Reflector

To eliminate the formed divergency beam, a second reflector is used. See Fig. 4. It is a spherical shield, S, mounted surrounding the dipole. It is not parabolic; it is spherical. The shield reflects radiation F-A back to point B. From B, it is finally reflected in the direction B-C. The energy that does not reach the shield will follow the normal path F-D-E as shown in the figure.

The shield should be large enough to surround the dipole and small enough to not obstruct the normal energy path. The shield should have a radius of a value λ/2 or a multiple of this value. The energy leaving the dipole in the axial direction will be canceled, but this has no importance since most of the energy will make appreciable angle with the axis.

The shield or second reflector actually produces reinforcement because the beam is reflected at A with a 180-degree phase reversal. The total path from F to A and F′ corresponds to

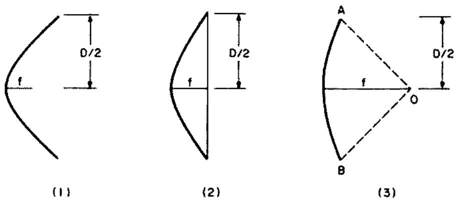

Fig. 5.

a phase reversal of 360 degrees. This, plus the 180 degrees from reflection, makes the beam returning along A-B 180 degrees out of phase, thus producing gain.

Instead of the second reflector, a three- or four-element beam could be used with the beam front aimed against the parabola. It is a practical approach for 23 cm and 70 cm but not feasible for microwaves, since horns are much more suitable at millimetric waves.

Size of Parabolics

The parabolic reflector is specified by its diameter and the focal distance. In Fig. 5, three types of parabolas with the same diameter and different focal distances are shown. Parabola 2 has the property that f = D/4 and parabola 3 uses a directional feed that confines the beam within the angle A-O-B. In this case the shield is certainly not necessary, since very little energy is radiated back from a high-gain antenna. Of course, the antenna is placed so that the beam is aimed against the parabola. In the case of parabola 1, the feeding should not be a directional antenna since the beam would not illuminate the whole reflector, with the consequence of loss of gain. In the case of parabola 3, if a dipole is used, scattering of signal is expected beyond the reflector edge. It is noteworthy that the feed antenna's gain is consequence of the directivity and has no meaning in the overall gain of the parabolic.

It should be noted that for a dipole (Fig. 4), radiation-lobe angle in the plane of the paper is greater than in the plane perpendicular to it. This means that the radiation pattern is not conical. If the dipole is vertically mounted, then the vertical angle will be wider than the horizontal angle. It is expected to be 1.25 times greater.

It is of paramount importance that the beamwidth of the feed be matched with the aperture angle of the parabola as seen from the feed. To determine the distance (f) from the focus point to the parabola vertex (P in Fig. 1), use the formula: $f = D^2/16d$, where D = parabola diameter and d = parabola depth (F-P in Fig. 1). For parabola 2 in Fig. 5, the distance f = parabola depth d. But for parabola 3, the distance f is greater than the parabola depth.

Cassegrain Parabolic

The feeding of parabolics is often a cause of divergence or energy scattering that produces undesirable side lobes. The feed structure blocks portions of the parabola and the energy reflected back to the energy source creates standing waves. The above problem, of course, is worse in mi-

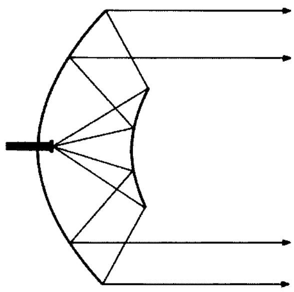

Fig. 6.

crowave parabolics that use bulky feedhorns. This is the case when maser or parametric amplifiers are placed very close to the feed. To avoid this problem, a technique known as Cassegrain is used. Cassegrain parabolics are fed from behind the parabola. See Fig. 6.

The main disadvantage of this type of feeding is the aperture blocking introduced by the hyperbolic subreflector used to reflect the energy back against the parabola. To overcome this problem, the feed is extended and the subreflector is reduced in size.

Parabolic Gain

The gain of a parabolic depends on its size. Any parabolic antenna may be used at any frequency as long as the feed system (dipole or whatever) is resonant at the chosen operating frequency. The gain is greater when the frequency becomes higher or the parabolic diameter becomes larger. The most important consideration is that the feed should entirely illuminate the surface of the parabola. The efficiency of the para-

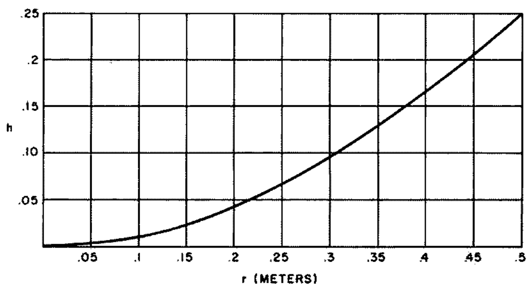

Fig. 7.

	Dish Diameter in Meters					
Band	**1**	**3**	**6**	**10**	**20**	**45**
6	–	1.3	7	12	18	25
2	1.3	10	17	21	27	34
1.25	5.4	15	21	25	31	38
0.7	10	20	26	30	36	40
0.23	20	30	36	40	46	53

Table 1.

bolic may be considered as 55%. Thus: gain over isotropic = .55($\pi\times$diameter/wavelength)^2. The parabolic beamwidth is calculated as follows: beamwidth = 137.5/(D/wavelength), where D = parabola diameter.

Designing a Parabolic Antenna for 23 Cm

Now, let's design a parabolic antenna for 23 cm using a parabolic reflector of 1 meter in diameter. This antenna could be used to work AMSAT Phase III mode L. The gain will be: .55[3.1416(1/.23)]^2 = 102; dB gain = 10 log (gain) = 20 dBi.

If a second reflector is used, then the power gain is quadrupled: 4 × 102 = 408. The dB gain will be increased by 6 dB: dBi gain = 10 log (408) = 26 dBi. −1 to −3 dB should be expected in actual construction.

Reflector Design

The parabolic beamwidth is calculated as follows: beamwidth = 137.5/(D/wavelength) = 31 degrees, where D = parabola diameter.

From the preceding discussion, it is known that the focal length should equal D/4 or 0.25 meters. Then the shape of the parabola is plotted on graph paper from the following equation: $h=r^2/4f = r^2/D$, where h and r are the axial and perpendicular distances in meters to any point P on the parabola. See Fig. 7. For our parabolic, D=1 meter.

The curve is then plotted by calculating various values of r as shown in Fig. 7. This way a template is constructed to which the parabola may be fabricated.

Mechanical Considerations

Any irregularity in the reflector tends to defocus the beam, increasing the side lobes and reducing both the gain and the beamwidth. The more the surface error, the more the ill effect. A surface error of up to 1/16 wavelength is tolerable. 1/16 wavelength at 70 cm is 4.38 cm and at 23 cm is 1.44 cm. So, at 70 or 23 cm it is very easy to achieve such tolerance. However, this tolerance is proportional to the reflector diameter. A 10-meter reflector would be expected to have surface defects 10 times greater than for a 1-meter reflector. Thus, the smaller the reflector, the more careful its construction should be.

Finally, it is worth mentioning that the lowest practical frequency limit for this kind of antenna is around 100 MHz. Below this frequency, the feed system and the gain-to-diameter ratio are far from desirable.

Table 1 shows the gains (dBi) achieved with several dish diameters for the amateur bands from 6m to 23 cm. In the table you will see that 20 Watts into a parabola of 1 meter (3 ft.) will allow you to reach Phase III mode L with the limit of 2 kW erp, not considering feedline losses. The 6-meter band is shown just for comparison purposes.■

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Control Your Mobile Power

Can commuting be a daily QSO party?
Yes, with this no-payment installment plan.

Bradley G. Mauger KB5QZ
48 F Ridge Road
Greenbelt MD 20770

Mobile operation is one of the most efficient uses of time possible. It allows me and, I am sure, many other amateurs to squeeze some operating into an otherwise too busy day. Almost all solid-state transceivers for any amateur band have been designed with operating mobile in mind and can be powered directly from an automobile's 13.8-volt power system.

Improper care in connecting amateur equipment to this power can cause problems, however, and, in some cases, even damage equipment. No one would knowingly try to operate a 13.8-volt radio from an eight-volt supply or from a supply that had 24-volt spikes on it. But low-voltage conditions can easily occur by having resistance in the circuit used to deliver power to the radio. Many high-power transceivers draw in excess of fifteen Amps while transmitting. Under these conditions, a few tenths of an Ohm can easily drop the supply voltage a few volts. A good, direct path from the battery to the radio should be made to ensure a steady supply voltage. This connection should also be fused for safety.

The assembled power controller mounted on the wheelwell in the engine compartment of my car. The relay is held to the plastic sandwich box with double-sided tape, the capacitor is held with a cable tie, and the box is held in place with a single sheet-metal screw which also is the ground point for the relay and capacitor.

When we start our cars, nasty things happen to the power system. For one thing, it gets loaded down by the starter's high current demand. The starter, while grinding away to start the engine, can induce huge pulses onto the car's power system. These high-voltage pulses can kill solid-state devices.

The Solution

Automobile manufacturers protect their radios and accessories from these starting transients by having a relay or switch connected to the ignition switch that disconnects power from these accessories while the engine is being started. This is why the radio turns off when the car is being started.

The circuit in Fig. 1 is a power-control system I use in my mobile operation. It uses the accessory voltage, which is disconnected automatically during starting, to operate a relay. Only when accessory voltage is present will power be supplied to the amateur gear. The capacitor helps filter out any residual noise and alternator whine.

Other than the accessory voltage wire to the relay coil, all wiring should be #14 or #12 stranded wire. Suitable wire can be found in the automotive department of most department stores.

Finding a place to put the circuit can be a difficulty, especially in today's smaller cars. I built mine into a soft-plastic sandwich box and bolted it onto the fender inside the engine compartment. Wires enter the box through tight-fitting holes. I mounted the fuse holder through a hole in the side where it would be handy and mounted the relay and capacitor to the box with double-sided tape. Fig. 2 shows the layout of my box, although most any layout would work.

Finding the Voltages

The 13.8 volts coming from the battery should be obtained as close to the battery as possible. Most cars have two leads on the positive terminal, a fat one that goes only to the starter and a thinner one, about a quarter inch in diameter,

that goes to everything else. This thinner one generally goes to a terminal block or a relay. Solder a large terminal lug to the input lead of the power controller and fasten this lug to the same post or connection that the thin battery wire is connected to. Some amateurs connect leads directly to the battery, but because of the corrosive conditions close to the battery, these connections can corrode and lose their good connection.

Finding the proper accessory voltage to operate the relay varies in difficulty from car to car. In my car, the positive wire from the radio was readily available under the dash, so I tapped into the line with a "squeeze" tap connector (Radio Shack 64-3052). If your car does not have a radio or if the radio's power lead is not available under the dash, the power leads of any accessory which automatically turns off during starting will be suitable (e.g., windshield wipers or heater fan). Otherwise, check around the fuse box for such a voltage. Even if your car has no radio, it usually has a fuse dedicated to accessories, and it might even be marked so. Whatever you find, be sure to check the voltage to make sure that it goes away when the starter is engaged.

Most cars have plastic or rubber plugs in the firewall. In order to pass wires from the engine compartment to the passenger compartment, I drill holes in these plugs. Try to make the holes no larger than necessary so that fumes from the engine compartment don't get into the passenger compartment.

Grounding

Even if you have a good, solid connection to the positive terminal of the battery, losses can be experienced in the ground or

The power controller, sealed in the plastic box, takes little room in the engine compartment and keeps the electronics safe, clean, and dry.

negative side of the circuit. In a car, the negative leg of the circuit is usually the car, its frame, and the body. This is not always sufficient, especially in newer cars.

In order to insulate the cars against sound and to eliminate squeaks and rattles, manufacturers put sound-deadening insulation between metal parts. This material is usually also an electrical insulator. Any current flowing between body parts must then travel though the bolts and screws holding the parts together. These often rust and lose their good connections.

I found this out accidentally by an experience I had with my car. I was having problems keeping a battery charged and had already replaced the battery and solid-state voltage regulator—which was fas-

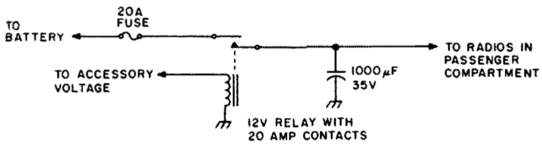

Fig. 1. Schematic of the power-control·box. The capacitor value is not critical, but should not be increased since it would increase the current surge through the relay.

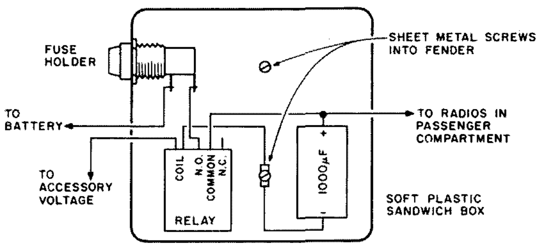

Fig. 2. The power control box as built into a soft-plastic sandwich box. The fuse holder is Radio Shack 270-367, the capacitor is 272-1019, and the relay is 275-218 with the common and normally-open contacts tied in parallel for increased current. The normally-closed contacts are not used.

tened to the fender in the engine compartment. My alternator checked out OK.

One day, after complaining to a mechanic friend, he took his voltmeter out of his toolbox and put the leads between the cases of the alternator and voltage regulator. The meter showed that, while the engine was running, there was over a volt difference between these two grounds. The ground connection of the voltage regulator had so much resistance that it was keeping my battery from being fully charged.

Placing a jumper wire between the alternator and the regulator fixed my low-battery problem. The moral of the story is: Don't trust grounds! Run a good stout ground line from the point the battery's negative terminal connects to the car (usually the engine block) into the passenger compartment, and ground all your equipment.

Temporary Installations

Sometimes it is not possible to make a permanent installation, as in a borrowed or rented car, for example, or in the spouse's car if your spouse doesn't share your enthusiasm for amateur radio. (My XYL, Mary, has little appreciation for a car full of radios, wires, and connectors. After years of explaining and demonstrating the pleasures of operating and construction, she still calls it CB just to irritate me.) However, generally cars have a cigarette lighter, and a cigarette-lighter adapter is available cheaply that can supply power in a pinch (Radio Shack 270-1534, for example). For VHF and above, magnetic-mount antennas provide a good means of temporarily connecting an antenna.

I have found that it is not a good practice to leave radios sliding around loose on the seat or floor while

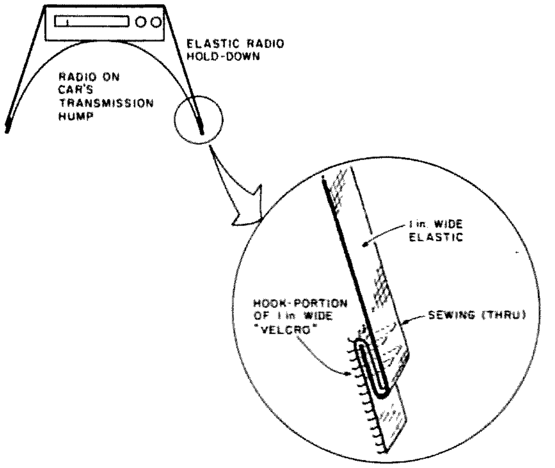

Fig. 3. An example of a radio mounted to the transmission hump with an elastic hold-down. The radio could be mounted on the side of the hump for better viewing. The insert shows the construction of one end of the hold-down.

driving. The device shown in Fig. 3 (which my wife refers to as my "bra-strap") can hold a rig firmly to the floor or to the transmission hump. I also use them to hold amplifiers and other accessories to the transmission hump of my car. It consists of the hook portion of a one-inch-wide piece of Velcro fastener sewn to both ends of an eighteen-inch length of inch-wide elastic. The hooks grab firmly into the carpet but can be peeled back off in less than a second. Black elastic and Velcro give a nice, professional look, but any color works.

Mounting Radios

A big problem with any mobile installation is that radios should be easy to disconnect and remove from vehicles. A locked door will discourage only a casual thief. I use a two-part mount that is sold for mounting car stereos. These are available at discount houses often for less than five dollars apiece. I bought six identical mounts so that I could mount all my rigs (and have a few spares, of course). I have two mounts in my car and have the remainder bolted to a short bookshelf in my shack. On the radio half of the mounts, I have mounted a ten-meter FM rig, a two-meter rig, a CB, and a cassette deck. Now all my radios fit interchangeably, and it takes only seconds to install or remove gear.

All my antennas have BNC connectors on them and all rigs have adapters to BNC connectors. This helps save time and keeps everything standardized.

The mounts I use have six sliding contacts. I currently use only two, one for power and one for ground, but I plan to use the others for external speakers and a remote mike.

Mobile operation can be a lot of fun, especially if time is spent on a good installation. This includes having good power and ground connections. In any case, try not to leave radios turned on while starting, and *never* transmit while starting. Hope to meet you soon on the air, mobile. ■

Virginia's Antenna Farmer

From Falls Church comes a simple message to fallow hams: Simple antennas work!

Bill Clarke WA4BLC
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Falls Church VA 22042

This is not just another innovative antenna article. I haven't reinvented the wheel and I shall not ask you to do mind exercises to understand obscure theory, nor shall I dazzle you with exotic physical design. I shall, however, provide the weekend "antenna farmer" with a simple-to-construct, surefire antenna project.

Most new-generation solid-state HF transceivers are designed for instant QSY but suffer severe swr limitations. Hence the need for broadbanded antennas that require no tuning or switching to QSY from band to band.

The antenna I shall describe is fail-safe, will work under even adverse conditions, and has no lossy coils, traps, or stubs. Best of all, it can be designed for any band or bands desired, fed with one feedline, and built in a few hours for only a few dollars.

Theory

The dipole antenna and various like antennas have been around for a long time. They are the workhorses of most antenna systems, although often hidden within complex design. The dipole is inherently balanced, broadbanded, and easily fed with coaxial cable. It works well on the lower amateur frequencies, giving good general coverage in all directions. It also is quite useful on 20 meters and above but does display some directional characteristics.

Many amateurs, capitalizing upon these characteristics plus the facts that dipoles are light in weight, inexpensive, and easy to install, have never felt a need for towers or directional antennas. Yet these same hams have worked WAS, 5BWAS, DXCC, etc.

Materials

First, before building the antenna, you must have a feedline to carry the rf from the transmitter to the antenna. I've found, over many years as a ham, that feedlines must reach from the transmitter to the antenna. No more, no less. Excess will only get in the way, and less won't reach. I've never found a need for quarter-wavelength or other measured feedlines.

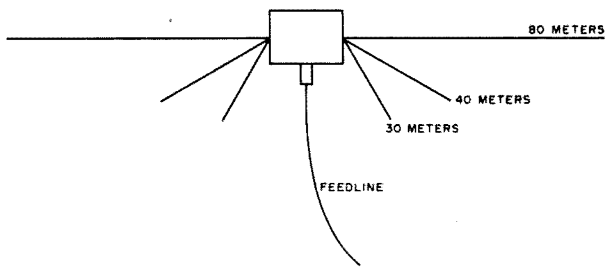
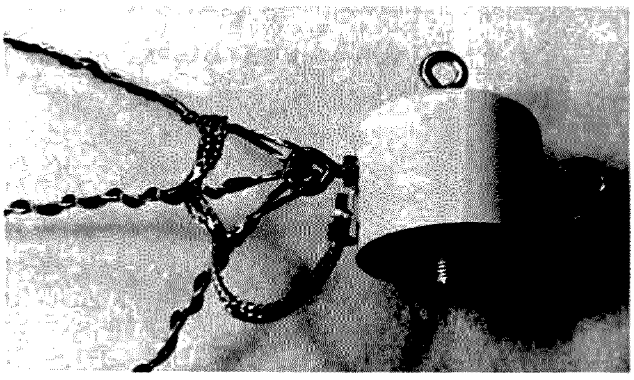


Fig. 1. Typical 3-band antenna with one feedline.



The center insulator with the left side of a 3-band antenna installed. Notice the use of the braid as a flexible connector line from the antenna itself to the center insulator lug.

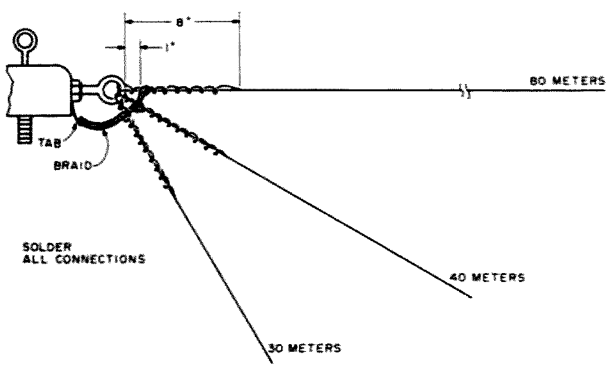


Fig. 2. Connection of legs to the center insulator.

The feedline should be RG-58 for output levels under 200 Watts and RG-8 for all others. At frequencies from 160 to 10 meters, these choices will function well and exhibit negligible losses (see Table 1).

Purchase your coaxial cable carefully; if good quality is purchased, you can be assured many years of use. Check the cable for the amount of shielding over the center conductor. Generally, the more shielding, the better the quality. To cut cost corners at this point is to invite trouble in later years with a poorly performing station.

Be sure the PL-259 connectors used on your feedline are installed properly. If in doubt, consult any of the handbooks for examples and guides on their proper installation.

It is a wise amateur who covers his outdoor feedline connectors with a weatherproof sealant. I generally use a silicone glue such as General Electric's RTV product. This will prevent moisture from entering your carefully purchased coaxial cable and avoid the moisture-associated problems of rf loss and high swr, both of which will affect your operation.

The wire for the antenna should be copper, stranded or solid, number 14 or larger, to ensure adequate strength. An alternative, used at this station for years, is galvanized electric fence wire. The latter is available in rolls of ½ mile, size #17, for about $15. You also will need a few insulators, some nylon or poly rope, and a center insulator. I recommend the Van Gorden Engineering HI-Q, at $6.95, available from most amateur outlets.

Construction

Table 2 gives the lengths of legs for the various bands of operation. The lengths noted are the distance from the center insulator to the end insulator for each leg. I recommend building this antenna for two to four bands. More than this will result in a clumsy package to handle and install (see Fig. 1).

In constructing your antenna, each leg must be strongly fastened to the center insulator, then soldered to the tab. I have found that a jumper wire from the leg to the tab is the best method, as it allows for flexibility during adverse weather conditions (see Fig. 2).

Each leg must pass through the eye of the center insulator and fold back eight inches. The eight inches is wrapped over the leg itself and soldered. After all legs have been installed in this manner, cut a piece of RG-58 six inches long and strip the braid off. Use this braid as the jumper, wrapping it once around each leg about one inch from the eye, leaving one inch free between each leg and soldering same to each leg. Then solder the free end to the tab.

Installation

When construction is completed, you must decide the method of installation—dipole or inverted vee. For inverted vees, the angle between the legs at the apex must never be less than ninety degrees or signal cancellation will result. A height of thirty feet at the apex will be adequate for most general operation. If a dipole is decided upon, the height should be equivalent to the apex of the vee—thirty feet or better.

The longest legs are the highest. All legs must be kept sufficiently above ground level so as to avoid having a shock hazard.

The antenna I use has legs marked with a single asterisk in Table 2 and is operated as an inverted vee. The height of the apex is thirty-five feet, fastened in a handy tree. All legs of my antenna end with a small plastic insulator and are tied to a support at least eight feet above ground level. This keeps the kiddies from coming into contact with the wires.

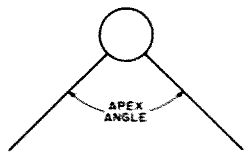


Fig. 3. Apex angle.

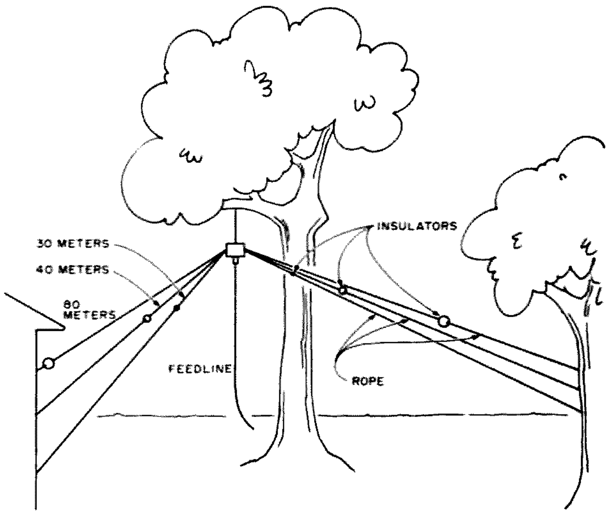


Fig. 4(a). Typical inverted-vee installation.

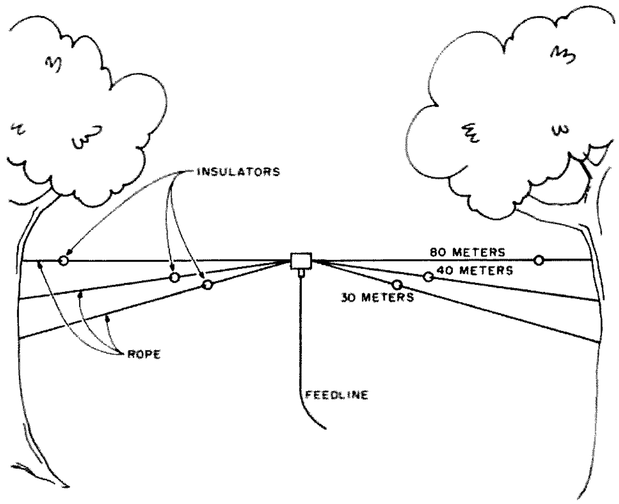


Fig. 4(b). Typical dipole installation.

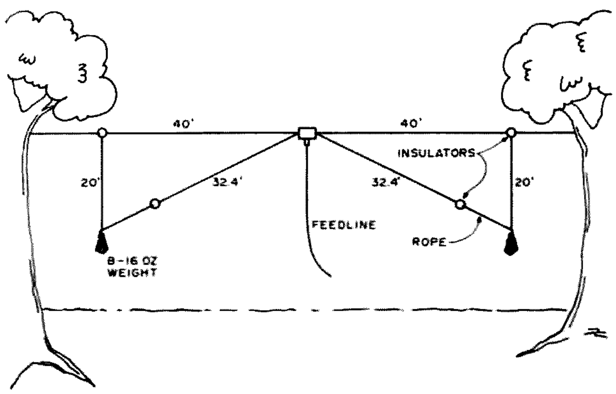


Fig. 5. Alternative design for limited space.

Band	RG-58	RG-8
160	.50 dB	.25 dB
80	.75 dB	.40 dB
40	1.00 dB	.55 dB
30	1.25 dB	.65 dB
20	1.50 dB	.80 dB
15	1.80 dB	.95 dB
10	2.50 dB	1.20 dB

As interpreted from the *ARRL Antenna Handbook.*

Table 1. Transmission line losses.

The feedline should be allowed to fall straight down from the center insulator, then led to the station. Try to align the feedline and the various legs to prevent the feedline from running parallel with any of them (see Figs. 3 and 4).

Testing

After the antenna is assembled and is in position, test it on each band and note the swr at the design frequencies. If the swr is 1.2:1 or less, you need no further adjustments. Should the swr exceed this limit, tune up the band 100 kHz and note the swr, then tune down 100 kHz and note that swr. If the swr is lower *up* 100 kHz, you must increase the length of the legs being tested. If the swr is lower *down* 100 kHz, decrease the length. The adjustments in length must be made equally to each leg of the band being tested or there will be a loss of symmetry. Use adjustment increments of six inches for 160 meters, three inches for 80, two inches for 40 and 30, and one inch for all other bands. Always test and adjust the lowest frequency band first, as this set of legs will be the support for the rest of the antenna.

Alternative Design

An alternative design that will allow operation on 80 and 40 meters in a limited space is built in a similar fashion, but the longest legs, those for 80 meters, are folded and the shorter legs are nested within them (see Fig. 5). This antenna has been a favorite of mine for many years and has given performance equal to any full-size antenna tried at this QTH. Be sure to keep the leg ends at least eight feet above ground level to avoid shock hazard. On the diagram you will notice weights on the ends of the folded legs; these are to keep tension on the wires and keep them straight.

Conclusion

These antennas give instant QSY for all bands of design with no need for an antenna tuner, which was the original goal, and will provide consistently good contacts. I have worked all states on 80 and 40 meters with these antennas, again attesting to the fact that simple antennas do work, and work well.

Remember safety and keep your antennas clear of all power lines. Happy "antenna farming."■

Band	Length in feet	Length in meters
160 low	126.5	38.6
160 high	120.0	36.6
80 CW	62.6	19.1
80 phone	* 60.5	18.5
40 CW **	33.1	10.1
40 phone	* 32.3	9.8
30	* 23.2	7.1
20	16.5	5.0
15	11.1	3.4
10	8.2	2.5

* The legs of the WA4BLC antenna.

** Often this set of legs will operate as a 3/4-wavelength antenna on 15, providing you with two antennas for the price of one.

Table 2. Antenna leg lengths.

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Throw in TV

Why not? This helix-building experience includes everything else. . .

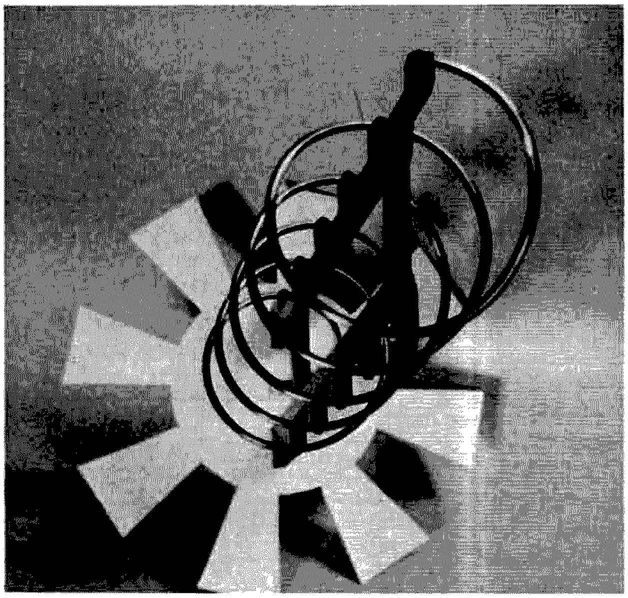
One of the major complaints made by radio amateurs is the lack of time for working on amateur-radio projects. Such things as mowing the lawn, painting the house, and gardening are brought up by the wife just when some time or a break in the weather is found for an antenna or other construction project. One solution I attempted was to mix my projects between those for the family and those for amateur radio.

For instance, recently I wanted to build a new antenna to receive OSCAR on 432 MHz. The antenna would be a helix. Helixes are circularly polarized and will reduce fading due to polarization rotation. However, I planned instead to build two antennas—both helical. The first would be for UHF television reception. It would be used to pull in channel 15 for the family television. Because of the wide bandwidth of the helix, reception of channels 27 and 33 would also be improved. The first antenna would serve as a prototype for the second, a satellite antenna. The second antenna was the one I wanted.

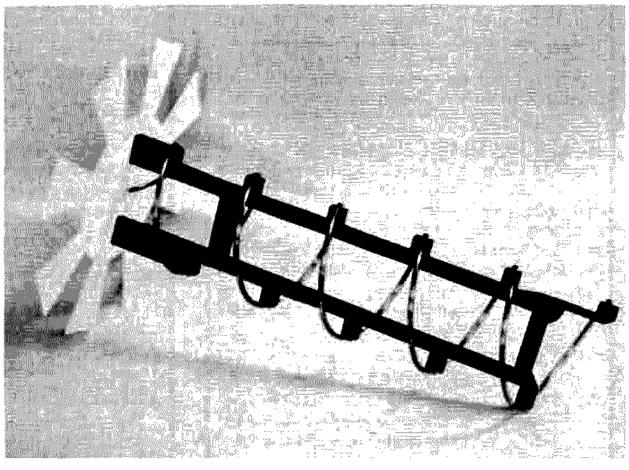
Design

The design of a helix antenna is straightforward and detailed methods can be found in the literature.[1-3] However, for amateur and entertainment applications, a few simple rules suffice.

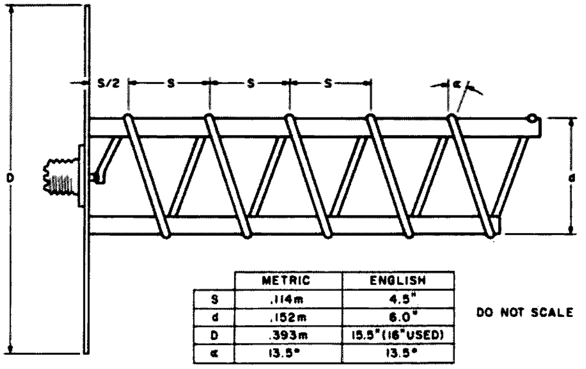
First, the circumference of one turn should be between 0.75 and 1.33 wavelengths. For use on a single frequency, a value of 1.0 is used. For the television antenna, I chose a center frequency of 610 MHz. Hence, the circumference of one turn is: C = 300/f(MHz), 300/610 = .49 meters or 19.4 inches. The low-frequency limit is then found by: $\lambda_L = 1.33 \times .49 = .654$m; $f_L = 300/.654 = 459$ MHz. The high-frequency limit is found by: $\lambda_H = 0.75 \times .49 = .369$m; $f_H = 300/.369 = 813$ MHz. The UHF television band extends from 470 MHz to 890 MHz.



End view of finished 5-turn helix for UHF TV reception.



Side view of UHF TV helical antenna. The antenna is right circularly polarized.



	METRIC	ENGLISH
S	.114m	4.5"
d	.152m	6.0"
D	.393m	15.5" (16" USED)
α	13.5°	13.5°

Fig. 1. Five-turn right-circularly-polarized helix antenna.

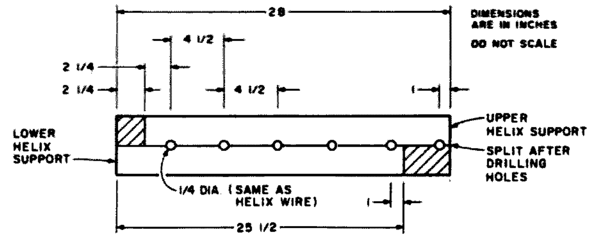


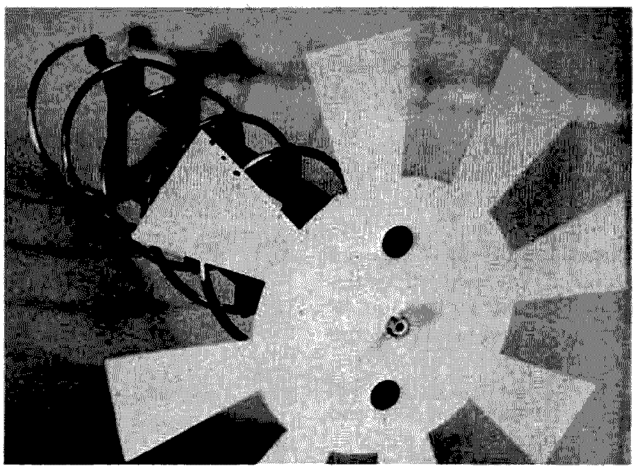
Fig. 2. Longeron construction.

Since our area is restricted to channel 49 or lower, the design is complete. I believe the antenna would work even for higher channels, but you can shift the center frequency to redesign for the higher channels if desired.

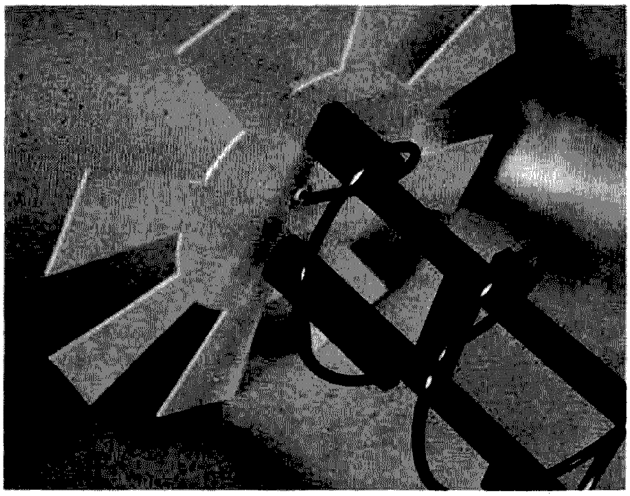
Second, the pitch angle for the helix should be between 12 and 15 degrees. I used a value of 13.5 degrees. Knowing the pitch angle (α) and the circumference (C), the turn diameter (d) and the turn spacing (S) are calculated as follows: $d=(C/\pi)\cos\alpha=(.49m/3.14)\cos 13.5=.152$ meters $=6$ inches. $S=C\sin\alpha=.49m\sin 13.5=.114$ meters $=4.5$ inches.

Third, the ground plane or disk diameter, D, should be equal to or exceed .8 wavelengths at the design frequency: $D \geqslant 240/f(MHz)=240/610=.393$ meters $=15.5$ inches (round up to 16 inches).

The final dimensional values are shown in Fig. 1. The diameter of the wire used to wind the helix should be between .005 and .05 wavelengths. For the television antenna, this translates to between 2.45 and 24.5 mm (0.096 and 0.96 inches). Quarter-inch copper tubing works well and looks impressive when cleaned and protected with clear lacquer. How much tubing is needed? Simply multiply C by the number of turns plus one to allow for the start. In this case: $L=C(5+1)=2.94$ meters or about 9 feet 8 inches. Hence, two antennas could be made easily from one 25-foot roll of tubing.



Rear view showing SO-239 connector and support mounting screws.



Close-up of supports and coax connector.

✔See List of Advertisers on page 114

After all, you have to buy the tubing for the family antenna. The leftover scrap will make do for your hobby antenna.

The input impedance of a helix can be approximated by: Z=140×C(circumference in wavelengths). Hence, for the television antenna, Z varies from a low of 105 Ohms to a maximum of 186 Ohms. If 93-Ohm coax is used, the vswr would not exceed 2:1, However, the impedance is seldom the nominal value and is influenced by how the first turn is made. I have found that for noncritical work, 75-Ohm coax is a reasonable compromise. For antennas used with medium- or high-power transmitters, particularly solid-state units, a matching network should be included.

Construction

The helix supports, or longerons, were made first. I was able to use a long scrap piece of phenolic material for the supports. Any insulative material could be used, i.e., dried wood, fiberglass, plastic, or bakelite. The helix supports were marked, drilled, and split from a single piece of material as shown in Fig. 2. The holes must be drilled before separating the two pieces. The two supports are separated with two spacers which were epoxied in place to maintain parallelism between the two helix supports. The helix turns sit in the half-hole notches. A round tile was used to slant the notches at 13.5 degrees. This allows the tubing to be seated all the way down. The antenna photographs show the spacers. They also show that I got carried away on the band saw and removed most of the excess material between the helix contact points. All I can say is that it does reduce wind load and weight and looks neat—but it is a lot of needless work.

Before winding the helix, the copper tubing was marked at each C/2 point to aid in accurately mounting the helix. The tubing was then close-wound over a short piece of 5½-inch tubing. If the wind is in the same sense as a right-hand-threaded bolt, the antenna will be right circularly polarized. After the coil was released, the far end was trimmed.

Next, the helix was slid over the support longerons. The trimmed far end was positioned over the last notch on the upper support and clamped, while a hand drill was used to drill through the tubing and into the support with a number 35 bit (6-32 tap size). Then the tubing was shifted over and just the hole in the tubing was drilled out with a 6-32 clear bit. The support piece was tapped and a ½-inch-long 6-32 screw was used to anchor the tubing down.

Turning the antenna over, the next C/2 mark was centered over the last notch on the lower support. As with the end, the tubing and support were drilled, the support tapped, and the two fastened together with a 6-32 screw.

This process was continued until each turn of the helix was firmly secured to the supports. The start end of the tubing was bent in a smooth curve to the centerline and cut off. The free end was drilled to accept the center pin of the coax connector.

The ground plane was cut from an old rack panel. Wire screen or hardware cloth would work well; I just happened to have this old panel which looked perfect for the job. Besides, getting rid of the panel can be considered as helping to clean the garage. Again, I got carried away on the band saw and the result is seen in the photographs. The final design functions as well as a solid disk but is lighter, has less wind resistance, and looks more interesting than a plain disk.

Mounted in the center of the ground plane is the coax connector, an SO-239. I know it is not a constant impedance connector, but it was cheap and it works OK. Anyway, I cannot seem to master the assembly of male type-N cable connectors. The two ¼-20 bolts that thread into the two helix supports and secure the ground plane to the supports are used to fasten the antenna to the mast via an aluminum angle bracket. A word of caution: If you use a chimney mount or mount near a chimney, make sure the antenna is below the chimney port. That way, the exhaust fumes, which are acidic, will bypass your work of art. The antenna will perform longer and will stay cleaner.

A short run of RG-58 connects the antenna to the balun on the television. Running twinlead to a balun at the antenna would gain a couple of dBs, but the extra gain was not needed. For my application, the secondary purpose in building the antenna was to get directivity and a little gain above the local tree line to reduce multi-path fading and flutter. The primary purpose was to buy time to work on a 432-MHz helix. While helping to install the helix, my wife noticed the gutters needed cleaning; maybe I can work on *my* antenna next month! By the way, the gain is between 9 and 11 dB over a dipole and the half-power beamwidth is about 50°. ■

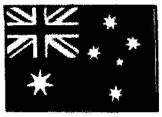
References

1. John D. Krauss, "Helical Beam Antennas for Wide-Band Applications," *Proceedings of the I.R.E.*, October, 1948, page 1236.
2. William L. Blair, "Putting the Helix to Work," *Radio & TV News*, November, 1958, page 66.
3. Jim Kyle, *VHF Antenna Handbook*, 73, Inc., 1965.

73 INTERNATIONAL

Each month, 73 brings you ham radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Jack Burnett.*



AUSTRALIA

J. E. Joyce VK3YJ
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Altona 3018
Victoria
Australia

After the disastrous Ash Wednesday bushfires in 1983, the Victorian State Government set up a Bushfire Review Committee and asked all the relief or emergency services that were involved to submit a report on their activities, plus recommendations for any improvements that these agencies thought would help in any future major disaster.

This, with respect to the role of WICEN (Wireless Institute Civil Emergency Network), was a case of shutting the barn door after the horse had bolted, for efforts had been made six months before the fires to clarify WICEN's position in the event of a major crisis. As a result of these discussions, WICEN was reminded of the vast improvements made in the communications equipment used by authorities in recent years, which meant that WICEN would not be needed except in circumstances such as an earthquake which "topples our antennas."

Just how much the authorities overestimated their communication capabilities in this type of disaster became tragically evident.

In light of the above, the Wireless Institute of Australia (Victorian Division) submitted to the Bushfire Review Committee a comprehensive report on the role that amateur radio, via our WICEN network, played in this emergency. As this report is too long to include in total, perhaps highlighting some of the faults we found in our operational procedure may help other overseas amateur emergency services to avoid the same problems.

Over 200 operators were mobilized or put under standby conditions during the Ash Wednesday period. Of these, only 30 were considered to have had any formal training with WICEN. In the event, the larger amateur population was pressed into service, and they performed very well.

Now to some of the problems. Where the WICEN operators were established at field stations, including relief centers, people did not know who the WICEN person was or where the WICEN camp was located.

People also did not know what was being provided or know how to use the WICEN communication network. They thought we were providing CB radio. These problems were usually solved by an explanation by the WICEN person, but a great deal of suspicion and reserve was still exhibited.

WICEN personnel were not identifiable through uniforms, badging, or identification cards. These would have made passing through road blocks and recognition at the point assigned for radio operations much easier.

WICEN control over movements of its personnel was inadequate because no formal arrangement existed with authorities and no proper provision had been made to cope with tasks which emerged. These included activities of an administrative and management nature, necessary in any well-oiled efficient operation.

Among the shortcomings of WICEN'S internal management was the fact that no formal records were kept of duty hours performed by field operators. This gave rise to situations in which personnel who had been without sleep for more than 24 hours were still volunteering for the next shift or another duty call elsewhere. Even when radio amateurs were ordered off duty, there was no way of checking that they actually did obtain rest.

The facilities at WICEN HQ were totally inadequate, basically because WICEN does not have a permanent HQ as such, with the result that operations were initiated at one radio amateur's home on Wednesday evening and subsequently an operating center was set up at another's garage/workshop which happened to have two telephone lines.

WICEN HQ operated for the first 2½ days with all meals being provided privately. On the third day, a mobile caravan was obtained from the State Emergency Services and placed in an appropriate site in a suburb of Melbourne. Here, personnel were obliged to solicit the aid of local residents in order to obtain toilet facilities, with food and drink still having to come from private sources.

Overall, the WICEN involvement was not only far from being an exercise in snappy message handling, tight net control, and efficient and accurate passing of formal messages, it was a disaster in itself. However, in terms of the provision of field communications in response to all known requests, the operation was a great success. It is considered that WICEN provided a significant contribution to the community.

I personally think that the service we are giving, as seen by others, is just as important as the service we think we are giving. Sometimes we tend to be blinded, within our own organization, by our own sense of achievement or failure.

Bearing this in mind, I feel the following letter of gratitude sent to the Victorian Division of the Wireless Institute of Australia says it all.

The Order of St. John In Australia
St. John Ambulance Brigade
Victoria District

In the wake of the devastating "Ash Wednesday" bushfires, I would like to place on record the Brigade's deep respect and appreciation for the vital communications links provided by the Wireless Institute Civil Emergency Network (WICEN).

There were many occasions during that tragic period when the Brigade's communications facilities were inadequate or rendered inoperative due to terrain peculiarities, traffic congestion, and other difficulties.

For the first time ever in a major incident of this magnitude, the Brigade was able to patch into the WICEN communication system with its own unique callsigns—VK3SJA and VK3SJB—adding a new dimension to emergency communication. The important benefits may be summarized in the following three points:

1. There were times in the field when communications difficulties were being experienced at the various control centers. These inadequacies in our own system were overcome by using the WICEN link to pass urgent messages to our own Communications Center, which was also part of the WICEN Net. In addition to this, we were able to provide more personnel in the field than would otherwise have been possible due to our limited communication facilities; this deficiency was overcome by attaching a WICEN radio operator to some of our units.

2. Perhaps the most important benefit inherent in WICEN is that it provides the ONLY inter-organization communication link in existence. Each organization has its own radio system, but none of these can inter-communicate. It's all very well to say that liaison between organizations must be carried out at headquarters level, but quite often in the field, time is of paramount importance. In our particular case, we found it extremely useful to be able to speedily liaise direct with the Red Cross, the CFA, and the Police on a number of occasions.

3. It amazes me at times out in the field just how long it takes for one organization to receive a request or a report from another organization working alongside; this is the classic inter-organizational liaison problem outlined in point 2 above. The advantage of the WICEN Net was further enforced because the Field Control Center was able to monitor WICEN traffic, and therefore: (a) the Brigade was better informed of the overall situation than would otherwise have been the case, and (b) we were able to anticipate requests for assistance from other sources and were thus organized by the time the formal request was received.

Like the Brigade, the Wireless Institute Civil Emergency Network is composed of volunteers highly trained for a specific task. The cost to the community of such a dedicated and skilled human resource is incalculable! The hours of training which amateur-radio operators put into their hobby and the wealth of experience gained "on air" would cost millions of dollars annually to emulate in a full-time service. The community at large is indeed indebted to the selfless dedication of the amateur-radio fraternity.

It is distressing in the extreme to learn that there is talk in some bureaucratic circles of limiting the ability of amateurs to pursue their hobby of communication and general experimentation by ad hoc and ill-conceived legislation in relation to antennas. Certainly a degree of sanity must prevail in regards to what protrudes into the air or hangs off a chimney! But surely the majority of amateurs are sophisticated enough to know what is socially acceptable in their neighborhood, and the rest I am certain would be only too pleased to reach a compromise.

The last thing we need is the intrusion of new legislation in what has traditionally been a self-regulating pursuit. A reasonable sprinkling of towers and antennas is a small price to ask the community to pay in return for a corps of skilled and dedicated enthusiasts who provide an unparalleled, voluntary, emergency service.

The Brigade looks forward to a long and rewarding association with the Wireless Institute in general and is always happy to accept the support and assistance of Institute members which has so readily been forthcoming in recent times.

Yours faithfully,
Michael A. Bonacci

BANGLADESH

Saif Shahid, Editor
BARL Bulletin
Bangladesh Amateur Radio League
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ANNUAL GENERAL MEETING

The 1983 Annual General Meeting of BARL was held on December 28, 1983. The agenda included setting up a two-member committee to make an in-depth study of the BARL constitution and suggest amendments and bylaws. The Annual General Meeting also showed satisfaction at the progress made so far regarding issuance of amateur licenses to its members.

A one-minute silence was observed to pay homage to the late Victor Clark. President Saif Shahid gave a short speech mentioning his personal experiences with Vic. His first contact with Vic was in April, 1982, during his visit to the USA. Saif Shahid was surprised at the discovery of the amount of knowledge and interest Vic had about amateur-radio affairs in Bangladesh. Saif Shahid saw Vic for the last time in Tokyo in September, 1983, while both of them were attending WARIC. Only two weeks before his death, Vic had written a letter to Saif wishing BARL all success. No doubt, amateur radio has lost one of its most respected leaders.

The committee for 1984 also was elected as follows: President, M. Saifud Dahar Shahid; General Secretary, Mahbubul Huque Khan; Treasurer, Manzoor Mannan; Members at Large, Iqbal Ahmed and Kh. Nazrul Islam.

BARL ANNUAL DINNER

The annual dinner was held on September 14, 1983, at the Hotel Sonargaon. The chief guest at the dinner was Prof. A. M. Patwary, Vice Chancellor of Bangladesh University of Engineering and Technology. Prof. Shamsuddin Ahmed, Chairman of the Department of Electrical and Electronic Engineering of BUET, also attended the dinner.

NEW IARU CONSTITUTION PROPOSED

With the objective of a modern, stronger, and more democratic IARU, a new constitution has been proposed. The proposed constitution contains seven articles, organized in a logical progression. The constitution answers the basic questions of what is the IARU, what are its objectives, and how is it organized? It also sets forth the fundamental rights, duties, and obligations of member societies. The 18 bylaws, on the other hand, provide detailed descriptions of procedure and set forth additional rights, duties, and obligations that are somewhat less fundamental.

Under the new constitution, the rela-

tionships between the component parts (entities) of the IARU will be changed somewhat. The regional organizations become an integral part of the worldwide body, with increased authority and responsibility. The "Headquarters" function is transferred to the Administrative Council, with a member society serving as International Secretariat to perform administrative functions in support of the Administrative Council. The IARU president and vice president will be nominated by the International Secretariat in consultation with the Administrative Council, subject to ratification by the member societies; the secretary will be designated by the International Secretariat. The officers may be members of any member society.

THE WARIC IN TOKYO

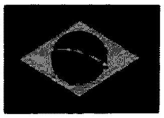
The World Amateur Radio International Conference was held in Tokyo, September 19-21, 1983, cosponsored by the Ministry of Posts and Telecommunications and the Japan Amateur Radio League, Inc., to commemorate World Communications Year. Saif Shahid attended at the invitation of JARL, as their guest. Besides Bangladesh, there were representatives from China, Federal Republic of Germany, Jordan, Korea, Malaysia, New Zealand, Nigeria, Oman, Pakistan, Thailand, Trinidad and Tobago, the UK, and the USA. In total, about 100 people attended the conference. The conference was particularly featured by the attendance of Richard E. Butler, Secretary General of the ITU, who participated in all conference events in addition to his impressive speech at the inaugural function.

The conference was chaired by the late Victor C. Clark W4KFC. The BARL representative was active in all conference activities and working-group meetings. In the concluding plenary session, the chairman read out to the house the news item from the *BARL Bulletin* regarding Wireless Board approval of amateur service in Bangladesh. The house applauded upon hearing the happy news. The conference adopted the Tokyo declaration.

GENERAL SECRETARY IN GERMANY

Nizam Chowdhury, the founder General Secretary of BARL, recently left Dhaka for West Germany for a year-long training in telecommunications. Nizam is one of those fortunate few whose profession and hobby are in the same field. The Annual General Meeting paid rich tribute to the past activities of Nizam in promoting amateur radio in Bangladesh. We wish him success in his career.

Mahbubul Huque Khan took over the office as acting General Secretary for the rest of the term after Nizam's departure.



BRAZIL

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Brazil

CW operating is much, much more than simply traveling through a new and marvelous international world!

Put all that's happening to the communications world together, and Wayne Green's "Never Say Die" editorial in the January, 1984, issue says it perfectly, and all who really know amateur radio will agree that CW represents the fantastic guardian, the sure link between the first real touch and the final success for radio amateurs.

In Brazil, a continentally-dimensioned country, curiosity for this communication may be the cause for temporary interest, and a no-code Class C was responsible for a new wave of hams, 80 meters and VHF being their immediate goal. Also, CBers have come to amateur radio, trying this new opportunity with its less-populated bands and excited by the news of a no code class.

Little by little, these newcomers discovered CW and what it really meant to be an amateur and to join all the wonderful options they had! At the least, CW is a bridge to working on antenna performances, and so a strong development in this field becomes a new and exciting challenge! And what about electronic keyers? And antenna tuners? And what about DX, the most fascinating "friend-factory" in radio? And what about QRP's fantastic surprises?

Most of all, CW brings you naturally to awards, and so you discover you're operating not just for operating, but because you're looking for something; you have a very stong reason to operate in this or that direction, aiming to hunt awards of all kinds. CW groups in Brazil are doing all they can to provide hams with a tremendous variety of awards.

The PPC Group has close to 20 awards, the CWRJ has almost 10, the CWP is now presenting a very interesting one, the GPCW in Santos has 4, the CWSP has 2—the second possible only if you complete the first—and the ABCW has 2 very interesting awards (one of them aimed at DX operations—the ATWAW). The CWRL, the GCWA, the CWGO, the CWSE, the PACW, the MCG, the MCPR, and all Brazilian groups have at least one award which is CW mode only.

We cannot keep up this rush: Last month's equipment is already obsolete because of competition between manufacturers. And costs are going up and up, and repairs are becoming owners' nightmares! Well, reasonably-priced equipment will pay wonderful dividends in CW, and even homemade QRP will bring you pennies from heaven at almost no cost if junk boxes are explored. Who can afford commercial prices? Only a few, considering this mess all around the world! Only a very strong force can keep amateur radio in many places and in many countries. And this force is the spirit of amateur radio strengthened and reinforced by CW, the most simple, the most efficient, the cheapest, and the most realizable of all options in our hobby.

CWP—CW PETROPOLIS GROUP

Just born in Petropolis ("Peter Land," named after Brazilian emperors Peter I and Peter II), the Petropolis CW group is the youngest of our CW organizations. It is born to stay, according to the bunch of FB radio amateurs chosen to form the operating crew for the CWP Award.

The program is under the command of PY1DFF and PY1QQ (Claudio and Mac, well-known DXmen) with Ossir PY1YOC as right-hand help. Beautiful awards, already printed, and a well-spread net of A1 CW operators are the hope for an immediate success of this new incentive towards the use and the practice of the most simple and efficient of all modes of communications among Brazilian and other radio amateurs: faithful old CW!

The CWP Award may be obtained in three different classes:

Class One—Work 10 Brazilian cities plus two QSOs with CWP members or delegates;

Class Two—Work 20 Brazilian cities plus four QSOs with CWP members or delegates;

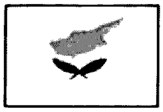
Class Three—Work 30 Brazilian cities plus six QSOs with CWP members or delegates.

Attention—Any CWP members or delegates can be used more than once if worked on different dates or bands!

Same rules apply for SWLs. No QSLs needed, but GCR apply. Fee: 7 IRCs. Mail to: CWP, PO Box 90415, 25600 Petropolis, RJ, Brazil.

CWP members: KA9KUH, PP2ADY, PP7JCO, PT2ACZ, PT2GK, PT7WA, PY1AFA, PY1APS, PY1AYE, PY1AZG, PY1BPR, PY1BVY, PY1CC, PY1DFF, PY1DK, PY1DMX, PY1DRW, PY1DWM, PY1DYO, PY1EBK, PY1EBN, PY1ECL, PY1EWN, PY1JF, PY1KT (YL), PY1MIT, PY1OB, PY1PL, PY1QN, PY1QQ, PY1RD, PY1TBW, PY1TG, PY1UBS, PY1URQ, PY1UTZ, PY1UUW, PY1UWI, PY1VEC, PY1VMV (YL), PY1WXU, PY1YOC, PY1YOV, PY1ZFF, PY2AC, PY2IL, PY2KQ, PY2MC, PY2MT, PY2ORW, PY2RLQ, PY2RRG, PY3MQ, and PY6AMJ.

All OSOs CW mode only; QSLs valid from December 1, 1983, on.



CYPRUS

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THE LARNACA MARINA AMATEUR STATION, 5B4MM

On the south coast of Cyprus there is the town of Larnaca, built on the location of the ancient Greek city of Kition, the city of one of the great Greek philosophers, Zenon of Kition. Larnaca today is a small city of about 60,000 people, with an international airport, a seaport, and a very modern marina for small boats.

The Larnaca marina is under the jurisdiction of the Cyprus Tourist Organization, and it has a radio station for the VHF marine band, with 10-hour daily operation on the channels of international navigation. This station is assisting the overloaded Cyprus Radio and has handled to date over 47 distress calls.

With the increase of foreign craft in the marina and the increasing pressure of foreign boat owners came movement by the management of the marina to set up an amateur-radio station. After many difficulties, 5B4MM finally went on the air in December, 1982. It is the only station of its kind in the eastern Mediterranean.

The station is operating with the personal callsign of the director of the marina, Glafkos A. Kariolou 5B4MM. Installed inside the buildings of the marina, it has an IC-720A, an automatic tuner, and two simple dipoles for 2.182 MHz (marine) and 7.040 MHz. It also has a "Western Yankee" rotary beam for 14, 21, and 28 MHz.

The station is licensed by the Ministry of Communications and Works to operate also outside the amateur band on the international marine frequencies (2.182 MHz, etc.). In this capacity, the station uses the call LARNACA MARINA. Operating daily (except Friday and Sunday), transmission starts at 0830 UTC on 7.040 MHz with a weather bulletin for the sea area between Cyprus, Egypt, and Israel (35B.33B-30A.35A). This area has seacraft coming from the coast of Turkey, usually from America, England, Australia, or New Zealand. There is also a lot of traffic from the island of Rhodes, but more traffic is from Port Said, with boats entering the Mediterranean.

Information given by the station besides the WX report includes exchange rates of various Mediterranean countries, data on navigational beacons, hazards, and radio beacons. Given on request is medical advice, minor engine repair assistance, exchange of messages with other stations, relaying, and any other service within the framework of law and for the security of human life at sea.

The position of every craft (latitude, longitude) as well as the weather conditions facing it is recorded in detail, and routes of all are followed daily. In case there is unexplained absence from contact schedules, the embassy of the country to which the craft belongs is notified and also a general search call is given by the marina station.

At 0900 UTC, 5B4MM interrupts its transmission on 7.040 MHz and moves to 14.313 MHz, taking over from the international maritime amateur net station, INTERMAR (located in Hannover, Federal Republic of Germany, with OM Arno DK9SS). The same work is repeated here for sea areas around Sweden, England, the Canary Islands, and Port Sudan, including the Indian Ocean, depending on conditions. Here, important bulletins are issued about yacht thefts, missing boats, private raids, etc.

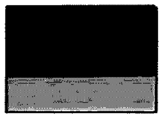
At 1000 UTC, the microphone goes back to Arno and 5B4MM listens periodically between 1000 and 1015 UTC on 21.380 MHz and from 1015 to 1030 UTC on 28.666 MHz.

The frequency of 14.313 MHz is used by six stations worldwide in turns, one being 5B4MM, on a 24-hour basis for maritime mobile radio amateurs. Many amateurs owe their lives to this completely voluntary service.

From the 5B4 point of view, the publicity given to 5B4-land is invaluable, and from the tourist side it is enough to say that yachts following the Cape Town and stateside route change their route to visit and get to know 5B4-land and its people.

The sked of 5B4MM, daily except Friday and Sunday:

7.040 MHz, 0830-0900 UTC
14.313 MHz, 0900-1000 UTC
21.380 MHz, 1000-1015 UTC
28.666 MHz, 1015-1030 UTC



FEDERAL REPUBLIC OF GERMANY

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INTRUDER WATCH

Almost everyone has experienced radio interference by stations not belonging to the Amateur Radio Service. But most of us ignore their transmissions if heard on our exclusive amateur-radio bands or subbands assigned primarily to ham radio. The average ham simply tunes to another frequency and hopes to have more fun there. However, this is not much of a solution to the problem.

The International Amateur Radio Union's Monitoring Service, with its headquarters in England (Region 1) and regional coordinators W7JIE (Region 2) and ZL1BAD (Region 3), addresses the problem on a worldwide basis. A number of national-intruder-watch services provide the

necessary fundamental work. DL4TA, EA4OK, F6GNP, G5XB, HB9OO, I2AMC, LU6DO, OE6KOG, ON5AZ, PA0VDV, PT2JB, and YB9MS—to name a few—are representatives of the intruder-watch services in their respective countries.

The fundamental task of intruder-watch services is the collection of data about intruders on our ham bands. Our national representative, Ralf D. Kloth DL4TA, assisted by DJ9KR and DK3FQ, issues a monthly summary of intruder observations contributed by a dozen corresponding hams. About 500 observations are reported each month, including date/time, frequency, type of emission, identification/nationality, type of radio service, and further remarks. The summaries are circulated to the IARUMS and among the national intruder-watch services, and they are filed with the German FCC.

This documentation encourages the national FCCs to discuss the intruder problems with other cooperating FCCs who have jurisdiction over the reported intruders. Successful negotiations, for example, moved Radio Cairo from 7050 kHz out of the 40m band, removed a strong second harmonic emission of Radio Free Europe on 14330 kHz, prevented the establishment of a fixed R/T service between Madrid, Spain, and Malabo, Equatorial Guinea, on 21400 kHz, and convinced the Iranian press service, IRNA, not to utilize the 40m band for their RTTY transmissions. The majority of cases, however, still need to be resolved. Satisfactory solutions require patience, good will, and cooperation of the various FCCs involved.

A successful action against an intruder needs support by individual hams. The reason is simple: No interfering station can be considered an intruder if there is no complaint. The respective FCC, in turn, can reference number 115 of the ITU regulations which tolerate the assignment of frequencies to another radio service if no interference with existing services is involved. Therefore, as a general rule, do not tune away from an interfering station. Rather, file a complaint with your national intruder-watch representative and give him as much information as possible on the incident. Monthly reports are timely enough.

But you can do more. For example, occupy the frequency of the intruder and zero-beat his RTTY or CW signals. Chances are high that the intruder will start moving, because many commercial and military stations use equipment with no more power than ours. Of course, this technique is most efficient for simplex transmissions (transmit/receive on the same frequency), but sometimes it works out on duplex (split frequency) transmissions, too.

In cases where you are not allowed to communicate with the intruder directly, test your keyer on his frequency with the following test pattern:

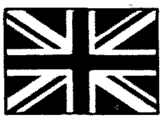
(UI)TA (OE)ASTOTA (OE)ASTX
MEVDUNARODNOJ L(IM)BITELXSKOJ
POLOSY (OE)ASTOT POVALUJSTA OSY
TOT(OE)ASVE

The letters shown in brackets should be keyed with no separation between them. It appears that some people in the eastern hemisphere interpret this pattern as "This frequency is part of the international radio amateur band—please QSY immediately." Some intruders have shown appropriate reaction. Thanks for this hint to ZL1BAD and *Ham Radio*, October, 1980.

In another attempt, DL9AH ran an automatic test in CW on the frequencies of broadcast stations in the 40m "exclusive" amateur-radio band, signing with his callsign. His 1-kW output signals—legal for a plate dissipation of the final amplifier not exceeding 150 Watts—could not be missed by potential broadcast listeners. The net result, however, *is still* to be determined.

Some people were able to confuse the woodpecker and make him move by a string of very-much-shortened dots from an electronic keyer. The "weight" control of the keyer did the trick. The efficiency of this measure is difficult to assess, particularly in the light of the sophisticated pulse coding of the woodpecker uncovered by G3PLX (*Wireless World*, April, 1982). But it is a fact that the woodpecker showed up less often when he had to share the frequency with a "string of dots."

All together, there are many ways to fight intruders, ranging from monthly reports to the intruder watch to the activation of occupied frequencies by whatever method is appropriate. In many cases, the required effort would take up only a few moments of your operating time. Wouldn't it be rewarding to spend this time to help defend our hobby?



GREAT BRITAIN

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Cheshire
England

1983 was a milestone year for the RSGB (Radio Society of Great Britain) with membership passing 35,000 for the first time ever. This increase shows a total growth in membership of 75% since 1977 and, I think, is due to two major factors.

First, there has been a steadily-increasing amateur population in the UK. The introduction a few years ago of the code-free Class B license (G8, G6, and G1 calls) for VHF only (144 MHz and above, to be more accurate) persuaded a great many more interested people to consider seeking a license.

Second, the increasing awareness of technology by "the man in the street" has broadened the spectrum of potential amateurs. There are also two particular technology-related areas that undoubtedly have produced a spin-off interest in amateur radio. These are computing and CB.

The UK has the highest per capita density of personal and home computers in the world. It is becoming increasingly difficult to find someone who does not own some form of computer. Although most computer/amateur-radio interaction has been from hams becoming involved with computers, there is evidence to suggest that computer enthusiasts have been attracted to amateur radio by applications such as satellite tracking and propagation prediction.

A recent survey of members of BARTG (British Amateur Radio Teleprinter Group) included questions about computers used now and planned for the future. Of the respondents, almost 65% currently have some form of computer system available for shack use. The predominant model is quoted as being from Sinclair (Timex in the US), although no breakdown is given between models. BBC and Commodore feature high on the list as well. Although the number of computers planned for the future is still only around two-thirds of respondents, the capabilities desired take a jump. Those hams currently into computing obviously want more use of discs, expanded memory, and printers. Clearly those aspects of amateur radio benefitting from computing (AMTOR, packet radio, satellite tracking, etc.) will be well represented in the UK.

I think I have mentioned previously that CB has been the biggest non-event of the decade as far as the UK is concerned. One-year CB licenses are being allowed to lapse in droves, and new license take-ups are very slow. No need to spell out the reasons for this. However, there has been a spin-off for amateur radio.

Many CBers who originally scorned amateur radio soon realized their mistake when legal CB first took off and 27 MHz was filled with the usual meaningless waffle (to say nothing of QRM, QRN, etc.). Couple this disenchantment with widely-available scanners listening to the (relative) calm of two meters, and you have a recipe for more hams.

Some interesting sidelines on UK CB—the 1984 version of the license specifically prohibits the playing of music and the retransmission of radio and television broadcasts; license holders must be aged 14 or more; loading coils can be located anywhere in the antenna and not only at the base (although antenna-length restrictions remain).

Back to the RSGB. The Society is also moving from strength to strength because of the increasing needs for amateur radio to be effectively and continually represented at government and other high levels in society. Continuing demands on our precious frequency allocations (particularly at UHF by the Ministry of Defence), increasing pressure for further restrictions on operating, regular misunderstanding and misquoting by the media, the difficulties of obtaining planning permission for towers, and the ever-present confusion with CB—all of these demand a strong representative body for amateur radio.

We are fortunate indeed to have such a body in the Society, but there are many other facets to the RSGB. The most obvious, and indeed most welcome, is the monthly *Radio Communication. RadCom*, as the Society's magazine is universally known, is not the only UK magazine devoted to amateur radio, but it is clearly the best and most comprehensive.

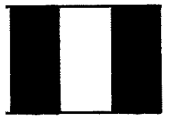
The Society operates an incoming and outgoing QSL bureau for all members. The service is free except for the provision of stamped, addressed envelopes with the incoming bureau. Outgoing cards need only be sorted into alphabetical order and dispatched to the QSL Bureau Manager. Incoming cards are handled by a number of sub managers, depending on one's callsign. Envelopes are dispatched as soon as the postal weight limit is reached—this gives the recipient some flexibility in rate of return.

The Society represents the amateur population (including nonmembers) in relations with the governing Department of Trade and Industry. This not only includes constant lobbying on behalf of amateurs, but also includes the holding (by the Society) of all repeater and news-bulletin station licenses (UK stations are not allowed to establish personal or closed-group repeaters or to broadcast to non-specific recipients).

The Society's full-time staff coordinates a number of volunteer groups handling, among other things—

- planning applications
- intruder watch (regularly reporting on ham-band intruders)
- IARU representation
- Radio Amateur Emergency Network (RAYNET)
- repeater working groups
- propagation studies

Perhaps the best thing about the Society is that all of the above, *including RadCom*, costs only $20.00 per year. Enquiries not to the writer, please, but direct to The Radio Society of Great Britain, Alma House, Cranborne Road, Potters Bar, Herts. EN6 3JW, England.



ITALY

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The most important news from Italy is the new meeting that has been held in Rome with the management of the Telecommunication Department of the Ministry of P & T. With the presence of the Minister (I8XNG), the situation has been carefully examined and there is a much more hopeful possibility of reaching an agreement. A press release issued by the Ministry talks about "the possibility of allowing hams to use 2 meters mobile" and "a more effective presence of radio amateurs on 3.5-3.8 MHz."

Reading between the lines, it does not seem possible to go back exactly to the previous situation, but probably we will be allowed to use 3500-3525 and 3775-3800 plus another 50-kHz slice, and we will be allowed to go out of those frequencies for "replies to international calls." This way nobody will lose face and everybody will be happy.

It seems that the change of approach to the problem is mainly due to the personal interest of I8XNG and to the strong opposition to the new rules by the management of the Italian amateur league (ARI). All the management has resigned from the positions held.

73 CONTESTS

Propagation has not been too good, but a few of the local big guns have participated in the contests on 40 and 80. On the lowest band, they have not paid too much consideration to the new rules and they have operated on the 3775-3800 portion of the band that is at the moment off limits for us.

Scores probably will be on the same level as last year. There are some doubts about the rules that are assigning 5 points to USA contacts and 10 for the rest of the world. It would be better to give 5 points for contacts with your same continent and 10 for DX.

PROPAGATION

Maybe you are interested in knowing what happens here in this period of low sunspot numbers. If you turn on the rig at 0700 local time, the only possibility (during January and February) is to go on 40 and try to work South America or VK. The band opens on 20 at 0730; you can "smell it" from the voices of UB5s and UA3s talking with each other. A few minutes later you start receiving weak signals from the Pacific. If the call is just a bit more exotic than a VK or ZL, the pileups are incredible. This situation lasts up to 0930; the skip then shortens and on 20 you have only Europe.

The choice is now between 10 and 15. Ten is very often completely closed. When not, it's very easy to find UJ8, UL7, AP, A4, and 4X4. On 15, the situation is the same

with a few more possibilities to YB, VK, 9M, VS6, and often Japan.

At lunchtime, the propagation on 10 and 15 opens to Africa. There are few stations operating from there, but when they do, their signals are always vary strong. In the afternoon, 20 meters opens to the US via long path and to the Far East.

The evening offers us the US via short path on 20, South America on the same frequency, and good openings on 40 to the Far East and Africa, followed shortly by 80 meters. The US is workable between 2300 and 0500 on both 40 and 80.

LOCAL HAM PRODUCTS

VHF and UHF antennas of Japanese, American, and French production are very easy to find in local shops. A lot of approval has been given to soma new locally-produced antennas and in particular to a 4-element delta loop with 13 dB of gain, a 12-elemant delta loop for 2 meters with 18 dB of gain, and the same one for the 70-centimeter band. A 23-elament log periodic from 130 to 1300 MHz has just begun to be sold, while a 12-element log periodic for the 13-30-MHz band is ready to be introduced in the market. Will provide you with more information later on.

SOCIAL ACTIVITY

I want to tell you about two examples of radio activity in Italy. First, the new QTH of the radio club of Civitavecchia (in the Rome area) is an old rail-truck that has been moved to the top of a 2000-foot hilt! It is a strange QTH but can be a suggestion for others. In Italy, old railcars are not very expensive!

Second, there is a new emergency communication center for the Milan county authorities. It started activity at the end of 1983. The authorities provided all the logistics while the local radio shops have donated most of the equipment. The emergency center can work on all bands and has its own repeaters on VHF and UHF. It can work RTTY, fascimile, and satellites. Beams are available on HF, while particular attention has been given to the 80-meter band which is the only one capable of complete coverage of all the nation. The center can provide space for 6 operators at the same time. The antennas are mounted on top of a 150-foot building. A truck equipped with HF, VHF, and UHF rigs is always ready for use. The conference room of the center can accommodate 500 people.

DX

The expedition to VU7 Laccadives has been the event of the month. It was very easy for us to work them, and a few of the local DXers have tried to work as many operators as possible as the callsign was the same for all of them. 15 meters was the easiest band, followed by 20. The activity on 10 meters was limited, but VU7 signals have always been strong.

The expedition also was spending a lot of time on 40 and 80 and this has allowed even the small pistols to work them. We are now waiting for Clipperton and Kermadec, and let's hope we will be in a position to say again it was not too difficult to work them.

T77C (ex M1C) is the first San Marino ham to achieve DXCC honor roll, and in the meantime, he has started to be active on 160. You can find him around 1.840 MHz. He has worked some Ws already and is looking for many more.

de I2MOP

Due to the limitations set by the Ministry of Posts and Telecommunications (MPT) to ham activity in Italy, a very heavy ill humor has befallen Italian radio amateurs. At the time this column is being written, we have the following situation.

- The 3.5-MHz band is reduced for amateur use to two thin slices, 3.613 to 3.627 and 3.647 to 3.667 kHz. Looking at these crazy numbers, one can understand that the 3.5-MHz band has practically been withdrawn as far as amateurs are concerned, because no serious DX or CW traffic may be carried on, referring to the IARU band plan.
- The MPT has assigned the band frequencies to other government services, mainly to the Defense and Interior Ministries. Every possible effort has been spent to explain to the MPT officials (and to their so called technicians) that throwing Italian hams out of the band is meaningless, because the whole band is shared by foreign amateurs with foreign fixed and mobile services. They don't seem willing to understand these very simple matters, but the general opinion is that the MPT has already compromised itself with the assignment (or the promise) of wide-frequency subbands into the 3.5-MHz band to government agencies. Moreover, the MPT persists obstinately to sustain the principle that the "sharing" concept for a band means that it must be divided into subbands.
- The very old law ruling amateur activity in Italy states that every amateur station should be installed in the residence of the amateur and that the station may be moved only after the MPT has given written permission. The only allowance ie made for the 144-MHz-and-up rigs with power not exceeding 5 Watts, which can be moved without permission. The law states "moved," but not operated on the way, which means that in Italy mobile operation is forbidden on both VHF and HF.

Although such statements make repeaters illegal also (which are installed on hilltops and not in the licensee's home), for many years Italian amateurs have used 144 mobile, playing with the ambiguity of the 144-MHz free-moving rule. They have installed a very efficient repeater net which played a big role during the emergency operations carried on during the course of the dramatic Friuli, Sicily, and Irpinia quakes.

- The new WARC bands have not yet been assigned to amateurs in Italy, and no provision has been made on the matter. Rumors are that the 10-MHz band will be divided into subbands, following the concept of the so-called engineers of the MPT, who seem to ignore that interpretation of the sharing concept is different all over the rest of the world and that radio waves don't know borders. On this basis, no more than 10 kHz will be allocated to the Amateur Service.
- For the past 25 years, the Administration did not care much when the Italian amateurs bypassed some outdated and ridiculous rules. In fact, they used the entire 3.5-MHz band according to the IARU band plan, they installed repeaters, and they worked 144 mobile. And the Administration did not move a finger in order to issue more adequate rules.

The reasons for the sudden and unexpected prosecution campaign of the MPT against amateurs, which started in June, 1963, are still not clear. Tight monitoring, inspections, fines, and license suspensions left the amateur community astonished—the more so because the Italian ether is the most chaotic and undisciplined in Europe, and amateurs considered themselves a quiet island in this stormy sea. Why harass the official amateurs when lots of illegal transmissions are carried on every part of the spectrum without apparent opposition by the MPT, asked the amateurs.

Unfortunately, in an emergency period like this, ARI showed a late and weak reaction. In the past years, ARI settled on lazy and ineffective political action in order to clear up problems of the amateurs with the MPT. One month ago, a meeting of ARI President Rosario Vollero I8KRV, the ARI Board, and the MPT officers was held, with incongruous results. The officers confirmed their will to allocate to the amateurs on the 3.5-MHz band only 100 kHz, from 3,500 to 3,600. Such an allocation would compel the phone stations to invade the CW portion of the band, with certain reactions from the IARU and foreign amateurs. At the same time, the MPT officers warned that 400 new inspectors would be put in service soon, and they announced tight inspections and checks also on the highways and roads to prosecute mobile operation. The reaction of the amateurs and of the ARI members was very heavy. President Vollero was accused of being the man responsible, having held the presidential charge for about ten years. His attitude toward the MPT was judged incongruous and supine, and he was charged with inadequate representativeness and lack of effective policy. At that point, Vollero and the entire Board of Directors resigned.

Rumors around were of plans of direct fights against the MPT: Somebody suggested an international mass mailing of cards directed to the Republic President, Sandro Pertini, with petitions on Italian amateur rights; another claimed that an occupation of the 3.5-MHz band with thousands of ham stations would be effective.

Some favorable movement started to appear inside the MPT. Maybe some politicals started to fear unfavorable damage to the MPT image, especially as far as foreign administrations and the IARU were concerned. The Minister of Telecommunications, in person, and the General Director of MPT suddenly invited the ARI President and the Board to a new meeting in the Minister's Gava office on January 20. That looked to be a bypass of the officers who had started the battle. In the course of the meeting itself, it appeared that some recognition was made of some requests of the amateurs, but it seemed clear also that the MPT was trying to get some concessions concerning renunciation of a part of the 3.5-MHz band.

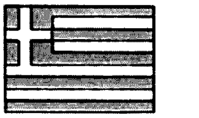
The MPT offered recognition of the VHF and UHF repeater net, a provisional allowance for mobile operation with 5-Watt maximum input, a possible early opening of the 1.8-MHz band and of the WARC bands, with some power and frequency limitations, but remained adamant about giving only 100 kHz to the amateurs on the 3.5-MHz band.

The ARI representatives, with members' pressure at their shoulders, refused to accept the 3.5-MHz proposed solution, stated many reservations about the proposed 5-W power input maximum rating for mobile use (mainly as far as HF was concerned), and said that the proposals would be discussed at the next ARI general meeting. A further meeting with the MPT officials was set for April 3, 1984.

Just after that date, a big international meeting of radio amateurs on emergency subjects will take place in Erice, Sicily, and IARU Region 1 representatives, the Minister of Telecommunications, and the General Manager of MPT have been invited. It appears clear that the MPT does not want to appear on that occasion as an enemy of amateur radio, thus the political pressure on the MPT technical staff which promoted this sort of war.

Surely there will take place a big battle at the next general meeting of ARI (which will be held in Rome next March). President Vollero I8KRV and his staff will try to be reconfirmed as heading the association, showing the partial success of their late effort. They will have the regional committees (which are the statutory organs which represent the members) to convince. The regional committees are of the opinion that a more incisive effort is needed in future approaches to the MPT and this shall be possible if the direction of ARI is given to amateurs who are in the position to be more respected by political and administrative personnel of the Italian government. That means that they should have a very good position as far as ties and friendships in the right direction are concerned. That does not mean that ARI should be politicized; it means only that ARI needs at its head people capable of some degree of political maneuvering. And that, in a country like Italy, where nothing is possible without politics, is essential also to defend amateur rights.

de I0XXR



GREECE

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Athens 11210
Greece

With the increased popularity of personal computers among radio amateurs worldwide, some interest appeared among SV amateurs three years ago. But, as in every small country, things were not so easy and some time had to pass by before availability became true for home computers in Greece. I think that today there are more people here selling computers than wanting to buy one!

Nowadays there is access to British and American markets and all big names plus the duplicates from Taiwan and Hong Kong are well represented. I have heard, lately, that the first Greek-made home computer is coming on the market, but up to now the only thing I know is that its name is Hermes (the Greek god and messenger of the gods). I will let you know when I have more information.

Of course, most of us want to go on RTTY with computers, and since the computer/modem combination is cheaper than the ready-made unit, this helped the interest to grow a lot. Now, there is a slight difference in software availability when someone comes to the point of choosing between an American and a British machine. In my opinion, the British ones lack serious programs for the radio amateur; if there are some, very few of them appeared in British ham magazines. On the other hand, American-made machines are more expensive, but there is plenty of software valuable to radio amateurs. Macrotronics, Kantronics, Micro-80, Inc., etc., for sure deserve a "bravo" for their excellent work in the amateur field. In the ham magazines, also, there are plenty of programs for radio amateurs; even computer mags such as *80 Micro*, *Rainbow*, *Run*, etc., include amateur-related material.

Although I have a TRS-80 Model I, level II, which has been out of production for some years now, I am able still to find programs for it today—and a lot of them.

Despite the situation described above, most of my fellow amateurs have British-made machines like Sinclair's ZX-81 and ZX-Spectrum. American-made machines are represented with a few Commodore VIC-20s and 64s, some TI 99/4As, and quite a few of Tandy Models I and II.

By the way, European readers will find a lot of ideas as well as programs in a column named "Rubrique micro-informatique" which appears every month in REF's (French Radio Union) magazine. Both British and American machines are supported. Listings are very well printed and the people there are doing an excellent job.

See you next month.

LIBERIA

Brother Donard Steffes, C.S.C.
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The modern amateur radio is more and more push-button controlled. There are some amateurs who shed tears as they see this happening. The home-brew rig is a rare thing these days and these amateurs are sure that the whole hobby is going to the dogs. At least they see great changes taking place and they see little that is positive in the direction that things are going.

Traditionally, amateurs have been enterprising and innovative and the modern amateur has not lost this quality. A fertile mind and an energetic personality are not dependent on how the designers put together a radio. They cannot be squelched and if they are not building rigs from scratch, they are probably designing circuits to track satellites. One thing is certain: Amateurs are not sitting around doing nothing. As always, they are contributing significantly in the field of communications and communication equipment.

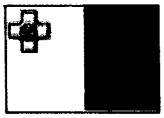
But here in Liberia we see these modern push-button radios from quite a different perspective. We tend, very quickly, to develop an aversion to switches. With our near-hundred-percent humidity, our tropical temperatures, and our harmatan dust, our switches stop switching. The air-conditioned home is not unknown, but not all amateurs have that luxury.

In this country, the amateur becomes the community repair man. "He knows everything about electricity." Into his shop comes anything that has ever seen an electron. When he takes off the cover, he finds molded coils and capacitors, mildewed circuit boards, rotted dial cords, rusted chassis . . . it is very discouraging.

The amateurs here are like amateurs in other parts of the world. They like their equipment and they do not sit around moaning as things deteriorate. They are very ingenious in devising ways to keep out moisture and dust. Some build cabinets with handy sliding doors to house their radio station. A desiccant inside helps to control the moisture. Others build shelves over their desk or table with air spaces under them. One or two well-placed light bulbs provide a convenient low heat source, and if everything is covered with a heavy cloth, it provides effective moisture and dust control.

It seems that in spite of everything that is done, it is necessary to polish the covers and lubricate the nuts and bolts several times a year or they will rust. During the rainy season, *it rains*. In Monrovia, it will total more than two hundred inches a year. During the dry season, there is the harmatan. The desert dust rises to more than forty thousand feet and blows across the whole country of Liberia. The natives like the harmatan because it tempers the blazing heat of the sun, but housewives and amateur-radio people do not like it at all.

In the tropical climate, everything that switches is going to stop switching much too soon. An obvious solution is to gold-plate all switch surfaces. Obvious also is the fact that so doing solves one problem while creating another!



MALTA

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Attard
Malta

Since writing my first column in this widely-read magazine (June, 1983), I have the following to add. Quite recently, Maltese radio amateurs were given permission to own hand-held, portable, and mobile equipment. The use of this type of equipment is restricted in that it has to be used forming part of the fixed station at the owner's address. Permission to use hand-held and mobile equipment from any other location has to be sought by the club from the W/T Office and this permission may be granted only on special occasions such as Field Day. The use of mobile equipment while in motion is strictly forbidden. This bit of information may be of interest to those who would like to come and spend some time on the island, because they will be able to bring along with them small VHF rigs which are not as heavy as the HF rigs. The VHF rigs must, of course, comply with the local regulations and must not cover frequencies higher than 146 MHz.

DXPEDITION

Some thirty members of the Malta Amateur Radio League (MARL) decided to put Comino Island for the first time ever on the air. This very small island lies about 15 minutes by boat from the mainland. The callsign used was 9H1MRL/A. Comino Island has only a handful of inhabitants. There are two very small but beautiful bays, the Blue Lagoon and Santa Maria Bay. The very luxurious Comino Hotel is also found on this little island, and it is usually visited by those who are interested in windsurfing.

The amateurs who took part in this expedition left the club premises in Attard (a small village situated in the center of Malta) at about 0400 GMT. That Saturday saw them taking all kinds of foodstuffs to last them a whole weekend. They also took with them an HF FT-101 transceiver and a TS-7000 VHF rig belonging to 9H1ES and 9H1FX respectively. The group arrived at Cirkewwa at about 0600, where all gear was loaded onto the patrol boat which took them to the islet. After all gear was taken from the boat, each one had to take his share of the load where it was decided to set up the station.

It was 0630 when some members started to erect the antennas, which consisted of three half-wave dipoles for 10, 15, and 20 meters for HF and a 12-element yagi for VHF. As there were no trees, erecting the aerials took quite some time, and it was only after a lot of improvisation that they were erected. At about 0745, 9H1O, who started operating the station, established the first contact with Australia, with VK2AKP. It was very astonishing that Sam VK2AKP was a Maltese national who had emigrated to Australia some twenty years ago! A lot of European and extra-European stations were worked both on SSB and CW while many Sicilian stations were contacted on VHF.

AWARDS

The MARL issues three very nice awards: the DIP MED Award, the 9H Award, and the MARL Golden Jubilee Award. The DIP MED Award is awarded to any licensed amateur-radio operator, SWL, or club station on confirmation of 2-way QSOs on the HF or VHF bands. The HF applicant has to work a minimum of 15 of the 26 Mediterranean countries listed. The VHF applicant has to work a minimum of 5 of the 26 Mediterranean countries listed. In both the above, 9H is obligatory.

Albania, Algeria, Balearic Is., Ceuta, Melilla, Corsica, Crete, Cyprus, Dodecanese Is., Egypt, France, Gibraltar, Greece, Israel, Italy, Lebanon, Libya, Malta, Monaco, Sardinia, Sicily, Spain, Syria, Tunisia, Turkey, and Yugoslavia are the countries.

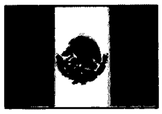
The 9H diploma is awarded to any licensed amateur-radio operator, SWL, or club station on confirmation of 2-way QSOs with 9H stations. Applicants in Europe need 10 points, and applicants outside Europe need 5 points. Each QSO with a 9H1 station counts as 1 point, each QSO with a 9H4 station counts as 2 points, and a QSO with 9H1MRL (club station) counts as 2 points.

No QSL cards are required for these diplomas. Send a certified list signed by another two amateurs together with 12 IRCs or US$2.00 if application is from Europe or 15 IRCs or US$3.00 if application is from outside Europe.

To commemorate the 50th anniversary of the founding of MARL, the League decided to issue a special award to be known as the MARL Golden Jubilee Award. Period: From 1st September 1983 until 30th September 1984. This award is available to licensed amateurs and SWLs (on heard basis).

To apply for this award, one must work 9H5ODC, the special station, which can be worked only once, and any other four 9H stations on any band and in any mode. Each station can be worked more than once on the same band but this must not be on the same day. No QSL cards are required, only a copy of the log certified by the awards manager of the national society or by two licensed radio amateurs. The fee for this award is US$3.00 or 15 IRCs.

Applications for any of the above awards should be addressed to: The President, MARL, PO Box 575, Valletta, Malta.



MEXICO

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I guess now and then it would be good to comment on some of the most frequently asked questions in letters that I have received from around the world since I have been a correspondent for *73*. I believe that if a fellow ham or anyone takes his or her valuable time to write, they should receive an answer, and since the answers to their questions may be of interest to many others, what better way to answer than through "73 International"!

In the February, 1984, issue, I commented extensively on the matter of getting a permit from the Mexican government to operate within the country on vacation or when passing through. I would like to add that your mobile or portable equipment should be registered by the customs officials at the border or place of arrival within the country, showing by means of approved documents that you are authorized to have and use such. Proper remarks will possibly be made on your tourist card so you will not have future problems during your vacation.

For our Mexican readers and for those in Mexico on vacation or passing through, *73* magazine can be purchased at practically any international airport in the country. In Mexico City, the famous Sanbourns restaurants, VIPS restaurants, and some American bookstores carry *73*. However, in spite of the relatively recent devaluation of the Mexican peso, the cost of *73* in Mexico (seemingly high locally) is obviously not high. It sells out at once.

Whenever I look for a certain issue when it supposedly is to come out, it's usually already sold out! I remember driving once from one end to the other of Mexico City only to come home empty-handed! (If you have ever been to Mexico City, you will sympathize with me.) So, Mexico sends its congratulations to *73* for a very fine magazine that sells just as well as the "quick tacos" on the streets! Wayne Green certainly does a fine job.

Some have asked me how I got started in ham radio. Well, besides the help I personally received from the Juarez City Radio Club and the Coatzacoalcos, Veracruz Radio Club (and especially from Mario Krespo XE1MCK), I read an article called "'Ham' Radio . . . A Hobby That Can Help Others," in the *Awake!* magazine (April 22, 1976, issue). I especially enjoyed it for its exactness and because, to me, it was written in plain language for a real beginner like myself. Back in those days, *Awake!* printed 9,925,000 copies of each issue in 32 languages! So it had to be simple and to the point and at the same time very interesting.

It also had a wide circulation in Spanish, here in Mexico. If you don't believe me, let me send you a photocopy of it in Spanish or English. Just send me a postal coupon and a few pesos and I'll have it Xeroxed and sent to you right away! Would be nice to have more literature for beginners (easy to understand) in Spanish as well! You never know, Wayne Green may surprise us some day! That would be wonderful for our Latin American colleagues! Think about it, Wayne! How many other thousands of future hams might get their start in the ham world by means of a beginner's book in Spanish, especially if it were very simple and up-to-date!

Most of the Spanish literature that I have seen available is old or just too technical for the beginner. (One possible reason for having so few hams in Mexico as compared to the US?) A beginner's book in Spanish could also aid the English-speaking to learn ham terms in Spanish. Then go for your Mexico license before coming down to warm Acapulco on vacation! It's just a six-hour drive from Mexico City, and you can stop off in Cuernavaca (known as the "eternal spring" since it is warm all year round) and then in Taxco to buy some good silver at low prices! If you would like to go out of your way, go to the state of Guanajuato, just north of Mexico City by a few hours, and have a leather case handmade for your handy portable!

Yes, Mexico is a very interesting and unique country with much variety and different cultures throughout. Spanish is the

Continued on page 132

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Yagi Fear?

Forget it. Whether for construction or comparison, this Atari program zaps every design problem.

Amateur-radio operators and shortwave listeners are always in need of a better antenna or an easier way of designing one. Also, teachers need a way of comparing one design with another as examples for their students.

Many superb antenna construction articles have been written over the years. However, there is still a frequent need for a design based upon a new frequency or number of elements. With the aid of the computer it is easy to compare design parameters for antennas having a differing number of elements.

This program was developed on an Atari computer for a yagi antenna having from 2 to 6 elements and is based upon the parameters of an idealized antenna model. The formulas used in the program have been generalized to increase simplicity. As a result, antennas constructed from the program data will function as indicated by the parameters. However, small ajustments of element lengths and spacing may prove beneficial for some parameters and applications—particularly if the same formulas are used for an increase in element number beyond six. An element spacing of 0.2 wavelengths was selected to reduce the effect of critical tuning parameters.

To simplify the construction of the program, repeating text messages—relating to element name, etc.—are stored as string statements. Several advantages occur as a result. It is easier to handle a string as a print requirement than it is to repeat the typing of each print statement. Of course, a real advantage occurs during editing of the entered program when a change or correction is to be made in the print statement. By having the statement contained within a string, a one-time "fix" in a single statement represents the change for every time the statement is called to print. In addition, a separate group of print statements was developed for each set of elements and for frequencies above and below 70 MHz. The frequency split was selected to accommodate the change in dimensions from feet for frequencies below 70 MHz to inches for frequencies above 70 MHz.

Dimensions

Dimensions for the antenna elements, element diameter, and element spacing are established as a function of wavelength by dividing 300 by the selected frequency in megahertz. Adjustments to the wavelength are made to compensate for a generalized velocity factor.

The program assumes that dimensions remain the same for an antenna array of 2 to 6 elements. With an element spacing of 0.2 wavelengths, dimension tolerances tend to be less critical than those arrays designed with narrower spacing. Element dimensions are given as a decimal for program convenience. However, generalized fractional dimen-

I—For/next loop counter
A$, B$, C$, D$, E$, F$, G$, H$, J$, K$, L$, M$, and N$—Print statements used during the printout of the design
P$—Temporary variable for entering a YES or NO response
F—Desired design frequency
N—Desired number of elements
EN—Element number print selector
BWL—Lower bandwidth limit
BWH—Upper bandwidth limit
W—Wavelength in feet
S—0.2 wavelength in feet
Z—Two wavelengths in feet
S1—Element spacing in feet
S2—Element spacing in inches
X—Wavelength in inches
D—Element diameter in inches
BD—Boom diameter in inches
A—Changes meters to feet
B—Changes meters to inches
RE/REF—Reflector length
DE/DEL—Radiator element length
D1/DD1—First director length
D2/DD2—Second director length
D3/DD3—Third director length
D4/DD4—Fourth director length
3—Clear screen

Table 1. Variables used in the program.

sions are also provided, based upon assumed available standard tubing dimensions.

Caution is suggested when selecting a boom diameter for an antenna designed for a frequency below 10 MHz. Although the program indicates a minimum boom diameter to provide support for the array, load factors, unsupported boom lengths, etc., must be considered. As the operating frequency decreases, the computer-derived boom diameter tends to be too small. The program does not restrict the design of a low-frequency yagi even though it may be mechanically impractical to build. There are times when the dimensions are desired as a comparison with other antenna types. A cautionary note is provided in the design printout, indicating that an alternate antenna design should be considered.

Feedpoint

The question most asked about an antenna design is "How is the antenna to be fed?" For user convenience, coaxial cable is the most desired. However, not all antenna designs will provide an unbalanced feedpoint for coax. Therefore, if the antenna has a balanced feedpoint, a matching device will be required to convert from a balanced feedpoint to an unbalanced transmission line. A balun or gamma matching device will satisfy most applications.

Feeding a balanced feedpoint directly with coax causes a feedpoint discontinuity which will be observed as a vswr problem of about 1.5:1 which cannot be corrected by typical antenna adjustments. If only the balanced/unbalanced discontinuity problem exists, little user notice will be observed if the transmitter will tolerate the vswr incurred. Corrective action must be taken for a vswr exceeding 2.0:1 because a problem exists somewhere in the antenna feedline system. Many commercially-built transmitters have a vswr detector in the rf output circuit to limit the power output when the vswr exceeds a selected value. That vswr value may vary from 1.4:1 to 1.7:1, depending upon the manufacturer.

The radiator element of a yagi antenna is balanced whether or not it is broken (cut in the center). When broken, a single element in free space would exhibit a center feedpoint impedance of 60-70 Ohms balanced. As additional parasitic elements enclose the radiator to form a yagi, the feedpoint impedance may decrease to a value as low as 10–15 Ohms. The feedpoint will remain balanced regardless of the number of elements surrounding it. The specific feedpoint impedance will be determined by element spacing and radiator element length-to-diameter ratio.

Most baluns have a 4:1 impedance ratio with the highest impedance appearing at the balanced terminals and the lowest impedance at the unbalanced terminals. When used with a yagi, the balun could be attached to a "T" match on the unbroken radiator at the 100-Ohm balanced point. It would then match coax at 50 Ohms. A more practical

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                    CUSTOM DESIGNING A YAGI ANTENNA

THIS ANTENNA WAS DEVELOPED ON AN ATARI COMPUTER
AS COMPILED BY HUGH WELLS  W6WTU --JULY 1981.

THE ANTENNA'S CENTER FREQUENCY IS 146 MHZ.
THE YAGI IS TO HAVE 5 ELEMENTS.


* THE FOLLOWING DIMENSIONS APPLY TO THE DIAGRAM AT THE BOTTOM OF THE PAGE.

THE REFLECTOR ELEMENT IS 38.99 INCHES LONG.
THE DRIVEN ELEMENT IS 37.04 INCHES LONG.
THE FIRST DIRECTOR ELEMENT IS 35.19 INCHES LONG.
THE SECOND DIRECTOR ELEMENT IS 33.42 INCHES LONG.
THE THIRD DIRECTOR ELEMENT IS 31.76 INCHES LONG.

THE FORWARD GAIN OVER A DIPOLE IS APPROX. 9 DB
OVER THE FREQUENCY RANGE FROM 141.62 TO 150.38 MHZ.

FORWARD BEAM WIDTH IS APPROX. 40  DEGREES AT THE 3 DB POINTS.

FRONT-TO-BACK RATIO IS APPROX. 19 DB.

WHEN BUILDING AN ANTENNA, CONSIDER THE WIND AND BIRD LOADING
WHILE SELECTING THE ELEMENT DIAMETER AND MATERIAL.

THIS YAGI DESIGN ASSUMES A CYLINDRICAL ELEMENT OF CONSTANT DIAMETER.

THE OPTIMUM ELEMENT DIAMETER IS 0.234 INCHES.
SUGGEST USING 1/4 INCH MATERIAL.

THE OPTIMUM ELEMENT SPACING FOR HIGHEST FORWARD GAIN
IS 0.200 WAVELENGTH.

THE SPACING BETWEEN ELEMENT CENTERS IS 16.17 INCHES.

SELECT A MINIMUM BOOM DIAMETER APPROX. 1 1/2 TIMES THE ELEMENT DIAMETER.
WITH THE APPROX. DIAMETER BEING 0.5 INCHES.

IF THE ELEMENTS ARE ACCURATELY CENTERED ON THE BOOM, INDUCED CURRENT WILL
BE MINIMUM ALLOWING THE BOOM TO BE METAL IF DESIRED. INSULATION BETWEEN
THE BOOM AND THE ELEMENTS IS NOT REQUIRED.

THE FEED POINT IMPEDANCE OF A CENTER BROKEN DRIVEN ELEMENT IS LOWERED
TO APPROX. 10-20 OHMS (BALANCED) WHEN THE ELEMENT IS ENCLOSED
WITHIN PARASITIC ELEMENTS.

BECAUSE OF THE LOW IMPEDANCE VALUE, A MATCHING DEVICE SUCH AS
A 'T', GAMMA, OR BALUN MAY BE REQUIRED.

AN UNBROKEN ELEMENT MAY BE DRIVEN WITH A 'T' OR GAMMA MATCHING DEVICE.

THE FEED POINT IMPEDANCE OF A BROKEN ELEMENT MAY BE RAISED BY INCREASING
THE LENGTH-TO-DIAMETER RATIO. MAKING THE DRIVEN ELEMENT DIAMETER SMALLER
WILL INCREASE THE RATIO.

A FOLDED DRIVEN ELEMENT ENCLOSED WITHIN PARASITICS WILL EXHIBIT
A FEED POINT IMPEDANCE APPROACHING 52 OHMS-BALANCED.

YAGI ANTENNAS ARE FAIRLY HI-Q AND OPERATE OVER A NARROW FREQUENCY
BAND AT AN EFFICIENCY OF 75-95 PERCENT.

THE ANTENNA MUST BE MOUNTED A MINIMUM OF TWO
WAVELENGTHS ( 13.4 FEET ) FROM GROUND AND OR BUILDINGS.


                               BOOM |
          REFLECTOR ----------------|----------------
                                    |
          DRIV ELEM   --------------|--------------
                                    |
          1ST DIR       ------------|------------
                                    |
          2ND DIR         ----------|----------
                                    |
          3RD DIR           --------|--------

                         FORWARD DIRECTION
                                    |
                                    V
```

Sample run.

approach is to use a gamma match (one half of a "T" match) on the unbroken radiator. The gamma match is a variable impedance transformer capable of providing an unbalanced feedpoint having an impedance from about 15 to 100 Ohms which is suitable for most coax types.

Antenna Gain

If an antenna were considered to be a point source in free space where it could emit energy equally in every conceivable direction, it would then have a gain of one. In a practical sense here on Earth, a point source cannot be achieved. A radiating device on Earth requires a support and will also radiate energy favoring one direction more than another. Although a point-source radiator is essentially impossible to construct, it is an ideal mathematical model for establishing gain concepts for practical antennas.

A dipole is a practical antenna which has a predictable and repeatable antenna-radiation pattern which can be described in terms of gain. A dipole, being resonant, will radiate energy perpendicular to the element plane causing very little if any energy to be radiated off the ends parallel to the axis of the element. More energy is radiated in one direction than in another, creating, in effect, a form of energy focusing.

To further understand the concept of gain, consider the antenna to be a transformer with a magnetic field being generated around the radiating element. Energy will be coupled from one element to another if the second element lies within the magnetic field generated by the first element. Of course, the elements must be in the same magnetic plane, as can be demonstrated with the primary and secondary windings of a transformer.

Program listing.

```
10 REM HUGH WELLS JULY 1981
20 GRAPHICS 18:POSITION 4,2:PRINT #6;"YAGI ANTENNA"
30 POSITION 6,4:PRINT #6;"PROGRAM"
40 FOR I=1 TO 3060:NEXT I
50 DIM A$(27),B$(13),C$(15),D$(24),E$(57),F$(33),G$(33),H$(44)
60 DIM J$(31),X$(33),L$(30),M$(33),N$(34),P$(1)
70 LPRINT :LPRINT "                    CUSTOM DESIGNING A YAGI ANTENNA"
80 FOR I=1 TO 5:PRINT :NEXT I:F=0:N=0:EN=0
90 LPRINT :LPRINT " THIS ANTENNA WAS DEVELOPED ON AN ATARI COMPUTER"
100 LPRINT " AS COMPILED BY HUGH WELLS  W6WTU --JULY 1981."
110 PRINT "ENTER THE CENTER FREQUENCY TO"
120 PRINT "THE NEAREST 0.1 MHZ."
130 PRINT "FREQ. IS ";:INPUT F
140 PRINT :PRINT "HOW MANY ELEMENTS IS THE"
150 PRINT "YAGI TO HAVE ( 2 TO 6 )?"
160 PRINT "NUMBER IS ";:INPUT N
170 LPRINT :LPRINT " THE ANTENNA'S CENTER FREQUENCY IS ";F;" MHZ."
180 LPRINT " THE YAGI IS TO HAVE ";N;" ELEMENTS."
190 LPRINT :BWL=0.97*F:BWL=INT(BWL*100):BWL=BWL/100
200 BWH=1.03*F:BWH=INT(BWH*100):BWH=BWH/100
210 W=300/F:S=W*0.2:Z=6.562*W
220 S1=S*3.281:S1=INT(S1*100):S1=S1/100
230 S2=S*39.37:S2=INT(S2*100):S2=S2/100
240 X=11803/F
250 IF F<10 THEN D=X*1.2E-03:GOTO 280
260 IF F<=23 THEN D=X*2.0E-03:GOTO 280
270 IF F>23 THEN D=X*2.9E-03:GOTO 280
280 D=INT(D*1000):D=D/1000
290 IF F<=100 THEN BD=D*1.5:GOTO 320
300 IF F<=200 THEN BD=D*2:GOTO 320
310 IF F>200 THEN BD=D*3.5:GOTO 320
320 BD=INT(BD*10+0.5):BD=BD/10
330 A=3.281:B=39.37:RE=W*0.482:DE=W*0.4579:DD1=W*0.435
340 DD2=W*0.4132:DD3=W*0.3926:DD4=W*0.37297
350 LPRINT :LPRINT " * THE FOLLOWING DIMENSIONS APPLY TO THE DIAGRAM AT THE BOTTOM OF THE PAGE.":LPRINT
360 A$=" THE REFLECTOR ELEMENT IS "
370 B$=" FEET LONG.":C$=" INCHES LONG."
380 D$=" THE DRIVEN ELEMENT IS "
390 E$=" THE FIRST DIRECTOR ELEMENT IS "
400 F$=" THE SECOND DIRECTOR ELEMENT IS "
410 G$=" THE THIRD DIRECTOR ELEMENT IS "
420 H$=" THE FORWARD GAIN OVER A DIPOLE IS APPROX."
430 J$=" OVER THE FREQUENCY RANGE FROM "
440 K$=" FORWARD BEAM WIDTH IS APPROX."
450 L$=" DEGREES AT THE 3 DB POINTS."
460 M$=" FRONT-TO-BACK RATIO IS APPROX."
470 N$=" THE FOURTH DIRECTOR ELEMENT IS "
480 IF N=2 THEN 550
490 IF N=3 THEN 710
500 IF N=4 THEN 930
510 IF N=5 THEN 1190
520 IF N=6 THEN 1490
530 GOTO 80
540 FOR I=1 TO 5:LPRINT :NEXT I
550 REM 2 ELEMENTS
560 IF F>70 THEN 620
570 REF=RE*A:GOSUB 2310
580 DEL=DE*A:GOSUB 2340
590 LPRINT A$;REF;B$
600 LPRINT D$;DEL;B$
610 GOTO 660
620 REF=RE*B:GOSUB 2310
630 DEL=DE*B:GOSUB 2340
640 LPRINT A$;REF;C$
650 LPRINT D$;DEL;C$
660 LPRINT :LPRINT H$;" 5 DB"
670 LPRINT J$;BWL;" TO ";BWH;" MHZ."
680 LPRINT :LPRINT K$;" 70 ";L$
690 LPRINT :LPRINT M$;" 8 DB."
700 GOTO 1820
710 REM 3 ELEMENTS
720 IF F>70 THEN 810
730 REF=RE*A:GOSUB 2310
740 DEL=DE*A:GOSUB 2340
750 D1=DD1*A:GOSUB 2370
760 LPRINT A$;REF;B$
770 LPRINT D$;DEL;B$
780 LPRINT E$;D1;B$
790 EN=3
800 GOTO 870
810 REF=RE*B:GOSUB 2310
820 DEL=DE*B:GOSUB 2340
830 D1=DD1*B:GOSUB 2370
840 LPRINT A$;REF;C$
850 LPRINT D$;DEL;C$
860 LPRINT E$;D1;C$
870 LPRINT :LPRINT H$;" 7 DB"
880 LPRINT J$;BWL;" TO ";BWH;" MHZ."
890 LPRINT :LPRINT K$;" 50 ";L$
900 LPRINT :LPRINT M$;" 10 DB."
910 EN=3
920 GOTO 1820
930 REM 4 ELEMENTS
940 IF F>70 THEN 1050
950 REF=RE*A:GOSUB 2310
960 DEL=DE*A:GOSUB 2340
970 D1=DD1*A:GOSUB 2370
980 D2=DD2*A:GOSUB 2400
990 LPRINT A$;REF;B$
1000 LPRINT D$;DEL;B$
1010 LPRINT E$;D1;B$
1020 LPRINT F$;D2;B$
1030 EN=4
1040 GOTO 1130
1050 REF=RE*B:GOSUB 2310
1060 DEL=DE*B:GOSUB 2340
1070 D1=DD1*B:GOSUB 2370
1080 D2=DD2*B:GOSUB 2400
1090 LPRINT A$;REF;C$
1100 LPRINT D$;DEL;C$
1110 LPRINT E$;D1;C$
1120 LPRINT F$;D2;C$
1130 LPRINT :LPRINT H$;" 8 DB"
1140 LPRINT J$;BWL;" TO ";BWH;" MHZ."
1150 LPRINT :LPRINT K$;" 45 ";L$
1160 LPRINT :LPRINT M$;" 12 DB."
1170 EN=4
1180 GOTO 1820
1190 REM 5 ELEMENTS
1200 IF F>70 THEN 1330
1210 REF=RE*A:GOSUB 2310
1220 DEL=DE*A:GOSUB 2340
1230 D1=DD1*A:GOSUB 2370
1240 D2=DD2*A:GOSUB 2400
1250 D3=DD3*A:GOSUB 2430
1260 LPRINT A$;REF;B$
1270 LPRINT D$;DEL;B$
1280 LPRINT E$;D1;B$
1290 LPRINT F$;D2;B$
1300 LPRINT G$;D3;B$
1310 EN=5
1320 GOTO 1430
1330 REF=RE*B:GOSUB 2310
1340 DEL=DE*B:GOSUB 2340
1350 D1=DD1*B:GOSUB 2370
1360 D2=DD2*B:GOSUB 2400
1370 D3=DD3*B:GOSUB 2430
1380 LPRINT A$;REF;C$
1390 LPRINT D$;DEL;C$
1400 LPRINT E$;D1;C$
1410 LPRINT F$;D2;C$
1420 LPRINT G$;D3;C$
1430 LPRINT :LPRINT H$;" 9 DB"
1440 LPRINT J$;BWL;" TO ";BWH;" MHZ."
1450 LPRINT :LPRINT K$;" 40 ";L$
1460 LPRINT :LPRINT M$;" 19 DB."
```

A higher antenna gain is exhibited when more of the radiated energy is coupled from the first element to the second by focusing (concentrating) the radiated energy. It is assumed that the radiated-power value remains constant and only the radiation pattern is manipulated. Since there is only a given amount of magnetic field generated around the first element, it is necessary to concentrate the magnetic field into the area (or direction) of the second element. The process is similar to focusing light energy with a reflector. A concentration of the field into one area has the same effect on the second element as if the radiated power had been increased. Antenna gain has been achieved by focusing the radiated energy.

A yagi antenna achieves gain by placing parasitic elements around the radiator. Each parasitic element is nearly resonant at the desired operating frequency of

```
1470 EN=5
1480 GOTO 1820
1490 REM 6 ELEMENTS
1500 IF F>70 THEN 1650
1510 REF=RE*A:GOSUB 2310
1520 DEL=DE*A:GOSUB 2340
1530 D1=DD1*A:GOSUB 2370
1540 D2=DD2*A:GOSUB 2400
1550 D3=DD3*A:GOSUB 2430
1560 D4=DD4*A:GOSUB 2460
1570 LPRINT A$;REF;B$
1580 LPRINT D$;DEL;B$
1590 LPRINT E$;D1;B$
1690 LPRINT F$;D2;B$
1610 LPRINT G$;D3;B$
1620 LPRINT N$;D4;B$
1630 EN=6
1640 GOTO 1770
1659 REF=RE*B:GOSUB 2310
1660 DEL=DE*B:GOSUB 2340
1670 D1=DD1*B:GOSUB 2370
1680 D2=DD2*B:GOSUB 2400
1690 D3=DD3*B:GOSUB 2430
1700 D4=DD4*B:GOSUB 2460
1710 LPRINT A$;REF;C$
1720 LPRINT D$;DEL;C$
1730 LPRINT E$;D1;C$
1740 LPRINT F$;D2;C$
1750 LPRINT G$;D3;C$
1760 LPRINT N$;D4;C$
1770 LPRINT :LPRINT H$;" 11 DB"
1780 LPRINT J$;BWL;" TO ";BWH;" MHZ."
1790 LPRINT :LPRINT K$;" 35 ";L$
1800 LPRINT :LPRINT M$;" 10 DB."
1810 EN=6
1820 LPRINT :REM ELEMENT DIAMETER
1830 LPRINT " WHEN BUILDING AN ANTENNA, CONSIDER THE WIND AND BIRD LOADING"
1840 LPRINT " WHILE SELECTING THE ELEMENT DIAMETER AND MATERIAL."
1850 LPRINT :LPRINT " THIS YAGI DESIGN ASSUMES A CYLINDRICAL ELEMENT OF CONSTANT DIAMETER."
1860 LPRINT :LPRINT " THE OPTIMUM ELEMENT DIAMETER IS ";D;" INCHES."
1870 IF D<=0.135 THEN LPRINT " SUGGEST USING 1/8 INCH MATERIAL.":GOTO 2000
1880 IF D<=0.3 THEN LPRINT " SUGGEST USING 1/4 INCH MATERIAL.":GOTO 2000
1890 IF D<=0.4 THEN LPRINT " SUGGEST USING 3/8 INCH MATERIAL.":GOTO 2000
1900 IF D<=0.5 THEN LPRINT " SUGGEST USING EITHER 3/8 OR 1/2 INCH MATERIAL.":GOTO 2000
1910 IF D<=0.6 THEN LPRINT " SUGGEST USING EITHER 1/2 OR 5/8 INCH MATERIAL.":GOTO 2000
1920 IF D<=0.8 THEN LPRINT " SUGGEST USING EITHER 5/8 OR 3/4 INCH MATERIAL.":GOTO 2000
1930 IF D<=1.2 THEN LPRINT " SUGGEST USING EITHER 1 OR 1 1/4 INCH MATERIAL.":GOTO 2000
1940 IF D<=1.6 THEN LPRINT " SUGGEST USING EITHER 1 1/4 OR 1 1/2 INCH MATERIAL.":GOTO 2000
1950 IF D<=1.8 THEN LPRINT " SUGGEST USING EITHER 1 1/2 OR 1 3/4 INCH MATERIAL.":GOTO 2000
1969 IF D<=2 THEN LPRINT " SUGGEST USING EITHER 1 3/4 OR 2 INCH MATERIAL.":GOTO 2000
1970 IF D<=2.3 THEN LPRINT " SUGGEST USING EITHER 2 OR 2 1/4 INCH MATERIAL.":GOTO 2000
1980 IF D>2.3 THEN LPRINT " * TBE MATERIAL REQUIRED FOR THE YAGI MAY BE TOO HEAVY TO BE SELF SUPPORTING.'
1990 LPRINT "   SUGGEST CHOOSING A DIFFERENT ANTENNA DESIGN."
2000 REM BOOM
2010 LPRINT :LPRINT " THE OPTIMUM ELEMENT SPACING FOR HIGHEST FORWARD GAIN"
2020 LPRINT " IS 0.200 WAVELENGTH."
2030 IF F>70 THEN 2060
2040 LPRINT :LPRINT " THE SPACING BETWEEN ELEMENT CENTERS IS ";S1;" FEET."
2050 GOTO 2070
2060 LPRINT :LPRINT " THE SPACING BETWEEN ELEMENT CENTERS IS ";S2;" INCHES."
2070 LPRINT :LPRINT " SELECT A MINIMUM BOOM DIAMETER APPROX. 1 1/2 TIMES THE ELEMENT DIAMETER."
2080 LPRINT " WITH THE APPROX. DIAMETER BEING ";BD;" INCHES."
2090 LPRINT :LPRINT " IF THE ELEMENTS ARE ACCURATELY CENTERED ON THE BOOM, INDUCED CURRENT WILL"
2100 LPRINT " BE MINIMUM ALLOWING THE BOOM TO BE METAL IF DESIRED. INSULATION BETWEEN"
2110 LPRINT " THE BOOM AND THE ELEMENTS IS NOT REQUIRED."
2120 LPRINT :REM FEEDPOINT Z
2130 LPRINT " THE FEED POINT IMPEDANCE OF A CENTER BROKEN DRIVEN ELEMENT IS LOWERED"
2140 LPRINT " TO APPROX. 10-20 OHMS (BALANCED) WHEN THE ELEMENT IS ENCLOSED"
2150 LPRINT " WITHIN PARASITIC ELEMENTS."
2160 LPRINT :LPRINT " BECAUSE OF THE LOW IMPEDANCE VALUE, A MATCHING DEVICE SUCH AS"
2170 LPRINT " A 'T', GAMMA, OR BALUN MAY BE REQUIRED."
2180 LPRINT :LPRINT " AN UNBROKEN ELEMENT MAY BE DRIVEN WITH A 'T' OR GAMMA MATCHING DEVICE."
2190 LPRINT :LPRINT " THE FEED POINT IMPEDANCE OF A BROKEN ELEMENT MAY BE RAISED BY INCREASING"
2200 LPRINT " THE LENGTH-TO-DIAMETER RATIO. MAKING THE DRIVEN ELEMENT DIAMETER SMALLER"
2210 LPRINT " WILL INCREASE THE RATIO."
2220 LPRINT :LPRINT " A FOLDED DRIVEN ELEMENT ENCLOSED WITHIN PARASITICS WILL EXHIBIT"
2230 LPRINT " A FEED POINT IMPEDANCE APPROACHING 52 OHMS-BALANCED."
2240 LPRINT :LPRINT " YAGI ANTENNAS ARE FAIRLY HI-Q AND OPERATE OVER A NARROW FREQUENCY"
2250 LPRINT " BAND AT AN EFFICIENCY OF 75-95 PERCENT."
2260 Z=INT(Z*10):Z=Z/10
2270 LPRINT :LPRINT " THE ANTENNA MUST BE MOUNTED A MINIMUM OF TWO"
2280 LPRINT " WAVELENGTHS ( ";Z;" FEET ) FROM GROUND AND OR BUILDINGS."
2290 LPRINT :LPRINT :LPRINT
2300 GOTO 2490
2310 REF=INT(REF*100)
2320 REF=REF/100
2330 RETURN
2340 DEL=INT(DEL*100)
2350 DEL=DEL/100
2360 RETURN
2370 D1=INT(D1*100)
2380 D1=D1/100
2390 RETURN
2400 D2=INT(D2*100)
2410 D2=D2/100
2420 RETURN
2430 D3=INT(D3*100)
2440 D3=D3/100
2450 RETURN
2460 D4=INT(D4*100)
2470 D4=D4/100
2480 RETURN
2490 REM PRINT YAGI DIAGRAM
2500 LPRINT "                                   BOOM |"
2510 LPRINT "                        REFLECTOR ----------|----------"
2520 LPRINT "                                        |"
2530 LPRINT "                        DRIV ELEM  ---------|---------"
2540 IF EN>=3 THEN LPRINT "                                          |"
2550 IF EN>=3 THEN LPRINT "                         1ST DIR     --------|--------"
2560 IF EN>=4 THEN LPRINT "                                          |"
2570 IF EN>=4 THEN LPRINT "                         2ND DIR      -------|-------"
2580 IF EN>=5 THEN LPRINT "                                          |"
2590 IF EN>=5 THEN LPRINT "                         3RD DIR       ------|------"
2600 IF EN>=6 THEN LPRINT "                                          |"
2610 IF EN>=6 THEN LPRINT "                         4TH DIR        -----|-----"
2620 LPRINT :LPRINT :LPRINT "                                  FORWARD DIRECTION"
2630 LPRINT "                                        |"
2640 LPRINT "                                        V"
2650 LPRINT :LPRINT :LPRINT
2660 PRINT ")":FOR I=1 TO 10:PRINT :NEXT I
2670 PRINT "      DO YOU WANT ANOTHER DESIGN?"
2680 PRINT :PRINT "      ENTER Y/N ";:INPUT P$
2690 IF P$="Y" THEN PRINT "}":GOTO 70
2700 PRINT "}":FOR I=1 TO 10:PRINT :NEXT I
2710 PRINT "                BYE BYE !!!"
2720 PRINT :PRINT :PRINT
```

the radiator and will absorb some of the radiated energy. By being nearly resonant, each parasitic element creates a phase shift in the energy it re-radiates. Energy radiated rearward creates an out-of-phase condition, reducing the actual rearward radiated energy. In the forward direction, however, the phasing is such that energy radiated by each element is in phase and is reinforced as the energy moves forward. The reinforcement process creates the effect of gain through forward-power concentration.

In creating antenna gain by power concentration in the forward direction, the radiated energy in other directions (areas) around the antenna is reduced considerably. If a measurement is made of the energy radiated in the forward direction and the energy radiated rearward, an antenna's front-to-back ratio would be determined. The front-to-back ratio of an antenna is further indicative of its gain and ability to focus energy.

Beamwidth

Beamwidth is another measurement of an antenna's ability to focus energy. The measurement is made by first establishing the antenna pattern which depicts the relative amount of energy radiated in a single plane around the antenna. The highest concentration of energy in one given direction is the forward direction. Beamwidth is determined by shifting angularly to either side of the forward position where the radiated power is down to one-half (−3 dB) of the forward-power position. The included angle between these two half-power points represents the beamwidth.

As the gain of an antenna increases, the beamwidth will decrease, indicating a higher concentration of energy in the forward direction. During antenna adjustments, a false sense of security can be developed if only beamwidth is observed as a gain factor. Yagi antennas have been known to decrease their beamwidth during adjustment while dispersing an increased amount of energy into a parasitic lobe (a power output in a direction other than the desired forward direction). When taken together, forward gain, beamwidth, and

front-to-back ratio represent the performance parameters of an antenna.

General

Because of the rather lengthy printout for each antenna design, it is recommended that a printer be used rather than attempting to read the data from the screen. However, if a printer is not available, the LPRINT command may be changed to PRINT. To stop the screen from scrolling long enough to read the data, an INPUT command may be inserted into the program. It is suggested that INPUT P$ be inserted about every 20 screen printout lines. Pressing RETURN (ENTER) will allow the program to run up to the next INPUT.

A typical five-element design for 146 MHz is provided to show how the printout should look when the program is running properly.

To run the program, it is necessary to enter only the center operating frequency and the desired number of elements (2-6). As an example of what happens, if two elements are selected, the program will assume the elements to be the radiator and the reflector. Additional elements will be added as directors numbered one through four with number one being closest to the radiator; number four will be the farthest away from the radiator. An antenna diagram is printed at the end of the design printout to provide clarity of construction.

All elements are mounted in a single plane along a boom, with each element centered on the boom (or through the boom) to keep the induced boom currents to a minimum. Material for the boom may be wood, metal, or fiberglass, with only strength and weight being the criteria. Aluminum tubing has proven to be a successful material for both the boom and elements.■

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½"x 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye," and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

I am looking for an RS-111 in any condition. Any leads will be appreciated.

James A. Ross
7906 Hope Valley Ct.
Adamstown MD 21710

I am looking for the service and instruction manual for the Lafayette PF-200A. I will pay copying and postage costs.

Donald P. Quinn
43d USAAD A Team
APO NY 09080

I have a large collection of your magazines (dating back approximately 14 years) which I am no longer able to keep in my home.

If you know of any school, organization, or person who might be interested in having these, please let me know. Many of them are in binders and I hate to throw out such a valuable collection.

Bob Cambreleng WA2USW
9 Whitman Drive
Denville NJ 07834

Can anyone supply information about a type CHC-46140 radio receiver made by Hammarlund? I have a schematic but no chart of values of components. Did this ever have a BC number or other nomenclature?

Harry Church W0KXP/9
PO Box 126
Lebanon IL 62254-0126

I have been teaching at God's Bible School now for eight years. Our school was started in 1900 to train future pastors and missionaries.

This year we started an amateur class in our college department for those who wish to work towards their licenses. We started out with twenty-four, but not all stuck it out. We now have nine with their Novice licenses. All are working toward their Generals, hopefully before the end of this school year. Others are working to finish up their Novice testing and also for further advancement.

What we are asking is, how can we get equipment to help train our students? We don't have funds to work with since this is a faith institution. We have heard that your Ham Help column has been very helpful to others, with ideas and sources for them to be able to obtain supplies and equipment. We would greatly appreciate any suggestions you may have. We are able to give receipts for tax deduction purposes and would be glad to do so.

If you are interested in knowing more about our amateur-class program, we would gladly furnish pictures or other information. We would even be happy to have you come see it for yourself.

Thank you for your time, and may the Lord bless you.

Floyd E. Hyatt, Jr.
Head of Industrial Arts
God's Bible School
1810 Young Street
Cincinnati OH 45210

Wanted: F455N20 Collins mechanical filter, 2 kHz, for an R390A receiver. Also need a manual for the BC-639 receiver.

Pat Kelley WA3NYH
3831 Snavely Road
Middletown PA 17057

I need the multiphase plug-in output couplers (10 and 15m) for the Central Electronics 200V transmitter or info on how to make them. Also, any info on the CE 200V would be appreciated.

Howard M. Mills W3HM/DA1AK
HHC 440 Signal Bn.
APO NY 09175

I am looking for a transceiver that would operate on all the popular amateur bands. I would like it to have sideband capability and perhaps digital readout. I would like to use this as a base station. Could you tell me where I might find a good up-to-date schematic and parts list?

I also would be interested in a good receiving-system schematic and parts list if such transceiver info is not available. I've looked all over and the best I could come up with is a 13-year-old receiver diagram.

Mike Higgins
1155 Birchwood Manor
Aurora MO 65605

I am an Advanced-class ham with a license that is only about 3 years old. I got into hamming because of my interest as a potential maritime-mobile when we retire aboard our boat.

Working the 14,313 net and other voice nets convinces me that it might be worthwhile to get into CW and RTTY for more reliable, if slower, communications under adverse conditions. I see all kinds of ads for communications interfaces, code readers, etc., and, frankly, I am overwhelmed by the variety of choices. What I should like to see is a good survey article which deals with the various possibilities that are available, making clear the range from the least expensive to the most luxurious, and what the extra bucks will buy one in terms of performance or modes of operation.

I am also interested in the possibility that with an interface between the receiver and a computer one could receive, store, and display facsimile transmissions such as those sent by NOAA. I realize that there is specialized equipment available for the purpose, but it is pretty expensive, and if one could make a computer serve two purposes with the aid of suitable software, that might be a popular route for people in my situation.

Finally, does anyone know how many of us are aready using the various modes of computer-aided communication? Some kind of statistics are needed to help a newcomer like myself avoid, on the one hand, going overboard with expenditures for equipment that will do everything (if there's hardly anyone using the fancier stuff) or, on the other hand, getting the minimum and finding that it won't talk with most of the crowd we want to talk to.

I enjoy *73*—hope someone can help me.

John H. Hughes N1BOS
28 Weal Drive
Marion MA 02738

I have a Heathkit Twoer Model HW-30 2-meter AM rig.

I have written to Heath concerning changing this rig over to FM or PM. They suggested that I write to you. Please help! I'm a disabled Korean vet and love to OX. Thank you for your time and concern.

Ivan E. Bates
USMC (Ret.)
117E Centennial
Boonville IN 47601

I have recently acquired Sinclair's ZX Spectrum microcomputer. I urgently need CW-receiving software for it. I also need any other ham software for it.

Ashmar Farman VU2FAX
178-A, Moazzampura
Hyderabad 500001
India

I am looking for a Ten-Tec Power-Mite (PM 2) 80- and 40-meter CW transceiver in good working condition with an AC-3 converter for 15 meters. Also, does anyone have any information on how to make a memory expansion board for the VIC-20 that will give more than 16K? Preferably, I would like to expand to 64K or more.

Fred J. Erickson
31 Ball Street
Orange MA 01364

Wanted: Laser disk Sears catalog.

PO Box 330
Valley Mills TX 76689

I have a WWII Panadapter with a 500-kHz input from the receiver rf. It was used with a Collins 51-j during the war. I want to use it with my Icom 720A receiver with an i-f output of 39.7315 MHz. Has any owner of a 720A built a mixer of this sort? Is there a manufactured receive converter made that I could buy or perhaps an Icom 720A group that could help me? I will buy a unit or gladly attempt to build such a converter. I need the expertise of some friendly ham. I will gladly pay the cost of such a unit!

James F. Hartley W1DIS
US Route #302, Box 11
Raymond ME 04071

I need service manuals for a Boonton model 240-A sweep signal generator and a Fluke model 800 differential voltmeter. I will gladly pay copying and mailing costs. Please write first.

Gordon Fulp W6FBH
4740 Scotch Pine Lane
Placerville CA 95667

I have one of the original TRS-80 Model Is and would like a schematic for a printer interface.

Joyce Amdor WB0ZQC
Box 39
Massena IA 50853
(712)-779-3435

I hope that you can possibly help me via the "Ham Help/Info Requested" column of your magazine.

I am in possession of a 6-channel HF-SSB marine transceiver made by Maritek, model no. SB6-60, approximate date of manufacture, 1973.

I have been able to trace the company through the US embassy here in London (Maritek, 1819 South Central, Kent WA 98031), but letters have been returned "Not Known" and a phone number given was found to be disconnected.

I have at present no information at all on the Maritek SB6-60 and would like very much to have (a) a copy of the workshop service handbook and/or circuit details, (b) a copy of the operations handbook, and any other info (especially that on the settings of the taps of the output stage).

I can arrange to have these photocopied in the US, Canada, or here in the UK, and the original returned. I am willing to reimburse any expenses incurred.

Kris Partridge G8AUU
6 Blagdon Walk
Teddington
London TW11 9LN
England

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

CHICAGO IL
MAY 2

The Chicago Amateur Radio Club's Evening Mini-Hamfest will be held on Wednesday, May 2, 1984, from 6:00 pm to 10:00 pm, at the Edgebrook Golf Course Field House, 6100 N. Central (between Elston and Devon), Chicago IL. Admission is $1.00 and card-table spaces are $3.00. Refreshments will be available. Talk-in on 146.52 MHz. For tickets, space reservations, or more information, send an SASE to CARC, 5631 W. Irving Park Road, Chicago IL 60634, or phone (312)-545-3622.

ST. DAVID AZ
MAY 4-6

The Cochise Amateur Radio Association, Inc., will hold a hamfest (upgraded from a swapmeet) on May 4-6, 1984, in St. David AZ. There will be a flea market and all tailgaters are welcome. Tours planned to Tombstone, the Bisbee Lavender Pit, and other places of interest. Talk-in on .16/.76 and .52 simplex. For more details, contact CARA, Attention: Bob Clay KB7HB, PO Box 1855, Sierra Vista AZ 85636.

NASHUA NH
MAY 4-6

The 10th annual Eastern VHF/UHF Conference will be held on May 4-6, 1984, at the Sheraton Tara, Exit 1, US 3, Nashua NH. Registration is $14.50 in advance and $20.00 at the door. Reservations for the Saturday-night banquet are $15.00 each, payable in advance. For advance registrations and banquet reservations, send a check to Rick Commo K1LOG, 3 Pryor Road, Natick MA 01760, before April 29th. Features will include a Friday-night hospitality room, technical talks by well-known VHFers, rap sessions for the various VHF/UHF bands, noise-figure and antenna measurements, and other activities. Room reservations should be made directly with the hotel (mention the Eastern VHF/UHF Conference) or other motels in the area. For further information, write Lewis D. Collins W1GXT, 10 Marshall Terrace, Wayland MA 01778, or phone (617)-358-2854 before 10:00 pm.

LUFKIN TX
MAY 4-6

The Region Four United States Air Force MARS will hold its annual conference on May 4-8, 1984, at the Rhodeway Inn, Lufkin TX. On Friday night there will be an administrative meeting for the headquarters personnel, state MARS directors, and all of the Region Four officials. For those not attending the meeting, the hospitality room will be open. On Saturday, there will be a series of presentations throughout the day, and that evening a banquet will be held for all delegates and their wives, followed by the annual awards. For further details, contact Ed Langston N5CIP, Conference Chairman, 1123 Sayers Street, Lufkin TX 75901.

SACRAMENTO CA
MAY 5

The North Hills Radio Club, Inc., will sponsor the 12th annual Sacramento Valley Amateur Radio Hamswap on Saturday, May 5, 1984, from 9:00 am to 3:00 pm, at the Placer County Fairgrounds, Roseville CA. Admission is free. Tables and tailgate reservations are $6.00 in advance and $8.00 on the day of the event. Talk-in on 144.59/145.19 MHz. For more information, contact D. Long, 8810 Swallow Way, Fair Oaks CA 95628.

CEDARBURG WI
MAY 5

The Ozaukee Radio Club will sponsor its 6th annual swapfest on Saturday, May 5, 1984, from 8:00 am to 1:00 pm, at the Circle B Recreation Center, Highway 60, Cedarburg WI (located 20 miles north of Milwaukee). Admission is $2.00 in advance and $3.00 at the door. Six-foot tables are $2.00 and eight-foot tables are $3.00. Food and refreshments will be available. Sellers will be admitted at 7:00 am for table setups. For tickets, tables, maps, or more information, send a business-size SASE to 1984 Ozaukee Radio Club Swapfest, PO Box 13, Port Washington WI 53074.

OWEGO NY
MAY 5

The 25th annual Southern Tier Amateur Radio Clubs Hamfest will be held on Saturday, May 5, 1984, at the Treadway Inn, Owego NY (take NY Route 17 to exit 65). The flea market will open at 8:00 am; other activities will include vendor displays and sales, tech and non-tech talks, and refreshments. Tickets for the dinner at 6:30 pm will be available by advance reservation only. Talk-in on .22/.82, .16/.76, and 146.52 simplex. For further information, please send an SASE to Craig P. England KF2X, RD #1, Box 144, Vestal NY 13850.

MEADVILLE PA
MAY 5

The tenth annual Northwestern Pennsylvania Hamfest will be held on May 5, 1984, beginning at 8:00 am, at the Crawford County Fairgrounds, Meadville PA. Admission is $3.00 and children under 12 will be admitted free. A 10-foot inside display table is $5.00 and an outside car space is $2.00. Refreshments will be available and commercial displays are welcome. Talk-in on 145.13, 147.21, 147.03. For more details, write CARS, Attention: Hamfest Committee, PO Box 653, Meadville PA 16335.

GREENVILLE SC
MAY 5-6

The Blue Ridge Amateur Radio Society will sponsor the Greenville SC Hamfest on Saturday and Sunday, May 5-6, 1984, at the American Legion Fairgrounds, White Horse Road, ½ mile north of I-85, Greenville SC. Admission is $3.00 in advance and $4.00 at the door. Food, plenty of nearby parking, and overnight camping with a limited number of hookups will be available. There will be drive-in unloading and loading before and after the hamfest. The area will be available for setups on Friday evening and security will be provided both Friday and Saturday nights. Talk-in on 146.01/.61. For advance tickets, write Mrs. Sue Chism N4ENX, Rte. 6, 203 Lanewood Drive, Greenville SC 29607. For further information, write Phil Mullins WD4KTG, Hamfest Chairman, PO Box 99, Simpsonville SC 29681.

COLUMBIA MO
MAY 5-6

The Central Missouri Radio Association will hold Columbia Hamfest '84 on May 5-6, 1984, at the Hilton Inn, I-70 and Stadium Boulevard, Columbia MO. Features will include forums, a hospitality room, a Saturday-night banquet, a hard-surfaced flea market, display tables, and shuttle-bus service to parking areas and shopping centers. Talk-in on .16/.76 or 220.42/.02. For banquet tickets, reservations for hotels, flea-market spaces or dealer tables, and more information, contact Ben Smith KØPCK, Route 1, Prairie Home MO 65068, or phone (816)-427-5319.

KANKAKEE IL
MAY 6

The annual Kankakee Hamfest will be held on May 6, 1984, beginning at 8:00 am, at the Kankakee County Fairgrounds. Tickets are $2.50 in advance and $3.00 at the gate. Features will include an FCC booth, a large flea market with both indoor and outdoor facilities, shuttle service from adjacent Greater Kankakee Airport, and refreshments. Talk-in on 146.34/.94. For motel reservations, call (815)-939-4551. For further information, phone Don Kerouac K9NR before 5:00 pm at (815)-937-2750, or write KARS Hamfest, 1377 Circle Drive NW, Kankakee IL 60901.

LONG ISLAND
MAY 6

The Suffolk County Radio Club Indoor and Outdoor Flea Market will be held on Sunday, May 6, 1984, from 8:00 am to 3:00 pm, at Republic Lodge No. 1987, 585 Broadhollow Road (Route 110), Melville NY. General admission is $2.00; children under 12 and wives will be admitted free. Indoor sellers' tables are $7.00 and outdoor space is $5.00 (includes one admission). There will be refreshments on the premises and plenty of free parking. Talk-in on 144.61/145.21 and 146.52. For additional information, contact Richard Tygar AC2P at (516)-643-5956 (evenings).

SULLIVAN IL
MAY 6

The Moultrie Amateur Radio Klub will hold its annual Sullivan IL MARK Hamfest on May 6, 1984, at the 4-H Fairgrounds, 3 miles east and 1 mile north of Sullivan on the Cadwell Road. Features include covered facilities, lunch, and a free swapper's row. Talk-in on 146.655/.055 and 146.520. For more information, contact William Guennewig WA9WOB at (217)-268-3139 (evenings).

SANDWICH IL
MAY 6

The Kishwaukee Radio Club of DeKalb IL will hold its annual hamfest on Sunday, May 6, 1984, at the Sandwich Fairgrounds, Sandwich. Tickets are $2.50 in advance and $3.00 at the door; tables are $5.00 each. Overnight camping without hookups will be available. For more information, contact Howard Newquist WA9TXW, PO Box 349, Sycamore IL 60178.

PARAMUS NJ
MAY 6

The Bergen ARA will hold a Ham Swap 'n' Sell on May 6, 1984, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. There will be tailgating only and admission for sellers is $4.00 (bring your own table). Buyers will be admitted free. Talk-in on .79/.19 and .52. For more information, contact Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855.

CENTRALIA IL
MAY 6

The Centralia Wireless Association, Inc., will hold its annual hamfest on Sun-

day, May 6, 1984, at the Kaskaskia College Gymnasium, 3 miles northwest of Centralia IL. Admission to the hamfest is free and there will be no charge for the flea-market and exhibit space (a limited number of tables will be issued on a first-come, first-serve basis). Doors will open at 7:00 am for flea-market and exhibit set-ups. Food and refreshments will be available, as well as plenty of free parking. Talk-in on 147.27/.87 and 146.52. For further information, contact Bud King WB9QEG at (618)-532-6606 or Lou Hodges W9IL at (618)-533-4724, or write to CWA, Inc., PO Box 1166, Centralia IL 62801.

DEERFIELD NH
MAY 12

The Hosstraders will hold their Spring Tailgate Hamfest on Saturday, May 12, 1984, sunrise to sunset, at the Deerfield NH Fairgrounds. Admission is $2.00, including tailgaters and commercial dealers. For a nominal fee, there will be Friday-night camping for self-contained rigs. No one will be admitted before 4:00 pm Friday and no spaces will be reserved. Profits will benefit the Boston Burn Unit of the Shriners' Hospital. Last year's total donation was over $4,700. For further information or a map, send an SASE to Norm WA1IVB, RFD Box 57, West Baldwin ME 04091; Joe K1RQG, Star Route Box 56, Bucksport ME 04416; or Bob W1GWU, Walton Road, Seabrook NH 03874.

ROGERS AR
MAY 12

The Northwest Arkansas ARC, Inc., will hold its 4th annual hamfest/swapfest on Saturday, May 12, 1984, from 8:00 am to 4:00 pm, in the Rogers Youth Center Building, 315 West Olive, Rogers AR. General admission is free. The fee for commercial exhibitors and flea-market tables/space is $2.00 on a first-come, first-serve basis. Doors will open at 6:00 am for setups only. Program activities have been scheduled and there will be a snack bar and parking on the premises. Restaurants are nearby. Talk-in on .16/.76 and .52 simplex. For more information, write Roy Milliren AF5W, 2014 South 18th Street, Rogers AR 72756.

YAKIMA WA
MAY 12-13

The Yakima Amateur Radio Club (W7AQ) will hold the Central Washington State Hamfest on May 12-13, 1984, at the Hobby Building at the Central Washington State Fairgrounds, Yakima WA. On Saturday, the hours will be 9:00 am to 5:00 pm with lunch available, and on Sunday, 8:00 am to 2:00 pm with breakfast and lunch available. Registration is $4.00 in advance and $5.00 at the door. Activities will include regional dealers' displays and a free swap and shop with plenty of tables. Talk-in on 146.01/.61 and 146.34/.94. For pre-registration, contact Bob Rutherford WB7WAM, PO Box 9211, Yakima WA 98909.

MEDINA OH
MAY 13

The Medina Two Meter Group will sponsor the Medina County Hamfest on May 13, 1984, from 8:00 am to 4:00 pm, inside the Medina County Community Center Building, Lafayette Road, State Rte. 42 SW. Tickets are $2.50 in advance and $3.00 at the door. Tables are $5.00 and some electrical hookups are available. Vendor setup will be at 7:00 am and refreshments and free parking will be available. Talk-in on 147.63/.03 (K8TV/R). For table reservations and advance tickets, write PO Box 452, Medina OH 44258, or telephone (216)-725-5021 or (216)-723-5010.

BEDFORD PA
MAY 13

The Bedford PA, the Altoona PA, the Somerset PA, the Cumberland MD Amateur Radio Clubs, and the Blue Knob Repeater Association will sponsor the second annual Southern Alleghenies Hamfest on May 13, 1984, from 8:00 am to 5:00 pm, at the Bedford County Fairgrounds, located one mile west of Bedford on Route 30 and one half mile west of the Route 220 bypass, close to the Bedford exit of the PA Turnpike. Admission is $3.00; inside spaces are $5.00 each and outside tailgate spaces are $2.00. Besides other hamfest activities, arrangements are being made for reduced rates to visit restored Old Bedford Village. Talk-in on 145.49 (Bedford repeater) and 146.52 simplex. For more information, call Tom Gutshall W3BZN at (814)-942-7334.

STIRLING NJ
MAY 13

The TCRA Flea Market will be held indoors on Sunday, May 13, 1984, from 9:00 am until 4:00 pm, rain or shine, at the Passaic Township Community Center, off Valley Road (opposite Jaeger Lumber and Building Material Center), Stirling NJ. Registration is $2.50 and tables are $6.00. Refreshments will be available. Talk-in on 147.855/.255 MHz and 146.52 simplex (W2LI/R). For table reservations or more information, write Dick Franklin W2EUF, PO Box 182, Westfield NJ 07090, or call (201)-232-5955 or (201)-270-3193.

WAGONER OK
MAY 18-20

The Broken Arrow Amateur Radio Club and the Tulsa Amateur Radio Club will sponsor the Greencountry Hamfest on May 18-20, 1984, at the Western Hills Lodge in Sequoyah State Park, located 8 miles east of Wagoner. Registration is $2.50 in advance or $3.00 at the door. There will be programs for the entire family. For more information, write Broken Arrow Amateur Radio Club, Inc., PO Box 552, Broken Arrow OK 74012.

FRESNO CA
MAY 18-20

The Fresno Amateur Radio Club will hold the 42nd annual Fresno Hamfest on May 18-20, 1984, at the Tropicana Inn, Fresno CA. The hours on Friday are 7:00 pm to 10:00 pm and on Saturday and Sunday, all day and evening. Before May 11th, full registration is $23.00 and banquet-only tickets are $14.00. After that date, full registration is $25.00 and banquet-only tickets are $16.00. Partial registration is $5.00 and tickets for the ladies' luncheon and program are $6.50. Other activities will include golf, technical sessions, a transmitter hunt, an ARRL forum, a QCWA

meeting, and a swap meet. Talk-in on 148.34/.94. For reservations and more information, write Fresno Amateur Radio Club, Inc., PO Box 783, Fresno CA 93712, or phone (209)-268-6314 or (209)-225-4699.

DURHAM NC
MAY 19

The Durham FM Association will hold the Durham Hamfest on May 19, 1984, at the South Square Mall in Durham NC. There will be shopping and movies for the ladies. Talk-in on 147.225/.825.

BIRMINGHAM AL
MAY 19-20

The Birmingham Amateur Radio Club will hold its annual Birminghamfest on May 19-20, 1984, beginning at 9:00 am each day, in the air-conditioned Birmingham/Jefferson Civic Center. Admission is $4.00 per person, valid for both days, and children under 12 will be admitted free. Flea-market reservations are not required and table rental is $6.00 per table per day. Setup time will be available Friday night and at 7:00 am on Saturday and Sunday. Features include an ARRL State Convention, Wouff Hong, a CW contest, a homebrew contest, meetings, forums, non-ham activities, a banquet, a flea market, and exhibitions. Talk-in on 146.34/.94 (W4CUE/R). For more information, write to Birminghamfest, PO Box 603, Birmingham AL 35201, or phone Keith Landrum KD4DQ at (205)-823-1628 after 6:00 pm Central.

BOULDER CO
MAY 20

The Rocky Mountain VHF Society, Inc., will hold the annual spring hamfest on Sunday May 20, 1984, from 9:00 am to 3:00 pm, rain or shine, at the Boulder National Guard Armory, 4750 North Broadway, Boulder CO. Admission is a $3.00 donation per family. There is no seller's charge but sellers should bring their own tables. Some tables will be provided, but if more than one table is needed, sellers should contact the organizers in advance. Features will include a big ham swap, technical demonstrations, and seminars. Food and drink will be available. Talk-in on 146.16/.76 and 146.52. For more information, write Richard Ferguson KA0DXM, 1150 Albion Road, Boulder CO 80303, or phone (303)-499-2871.

PITTSBURG KS
MAY 20

The Pittsburg Repeater Organization will hold its annual hamfest on May 20, 1984, from 10:00 am to 5:00 pm, at Lincoln Center, Lincoln Park, Pittsburg KS. Admission is $2.00 for each amateur and includes his family. Activities will include a flea market and a covered-dish dinner. (Please bring a covered dish; chicken will be provided.) For more information, write to Pittsburg Repeater Organization, c/o Steve Cooper, 1405 N. Elm, Pittsburg KS 66762.

UNION NJ
MAY 20

The Irvington Radio Amateur Club will hold its 12th annual hamfest on May 20, 1984, from 9:00 am to 3:00 pm, in new and expanded quarters at the Boys & Girls Club, 1050 Jeanette Avenue, Union NJ. Tickets are $1.00 in advance and $2.00 at the door; tables are $5.00 each. There will be plenty of on-site parking. Talk-in on .34/.94 and .52 direct. For table reservations, advance tickets, or more information, phone Walt W2QR evenings at (201)-763-2280, or write Ed Surmaitus WA2MYZ, 2133 Stanley Terrace, Union NJ 07083.

OAK HARBOR OH
MAY 20

The Sandusky-Ottawa County Combined Hamfest will be held on May 20, 1984, at the Ottawa County Fairgrounds, State Route 163, 3 miles east of Oak Harbor OH. Tickets are $2.50 in advance and $3.00 at the gate. Food, tables, and free parking will be available. Talk-in on 147.675/.075 and .52 simplex. For more information, write John Dickey, 545 N. Jackson Street, Fremont OH 43420.

ATHENS OH
MAY 20

The 5th annual Athens County Amateur Radio Association hamfest will be held on Sunday, May 20, 1984, rain or shine, from 8:00 am to 3:00 pm, at the Athens City Recreation Center, 733 East State Street, Athens OH (US 50 east). Admission is $3.00 at the gate. There will be acres of paved area for outdoor tables and tailgate displays at $2.00 per space. Indoor tables are $3.00 and are available by calling Joe NE8R, club president, at (614)-797-4874 for reservations. There will be plenty of parking and refreshments will be served. Talk-in on .34/.94 and .52. For further information, send an SASE to ACARA, PO Box 72, Athens OH 45701.

WRIGHTSTOWN PA
MAY 20

The Warminster Amateur Radio Club, Inc., will hold its 10th annual hamfest on Sunday, May 20, 1984, rain or shine, beginning at 7:00 am, at the Middletown Grange Fairgrounds, Penns Park Road, Wrightstown PA. Donations are $2.00 each in advance and $3.00 each at the door; XYLs and children will admitted free. Tailgaters will be charged an additional $2.00 for a 10-foot outdoor space; some 8-foot indoor spaces without power will be available. Food and drink will be served. Talk-in on 147.69/.09 MHz and 146.52 MHz. For more information and pre-registration, contact Bill Cusick W3GJC, Apt. 706, Garner House, Hatboro PA 19040, or phone (215)-441-8048.

WABASH IN
MAY 20

The Wabash County Amateur Radio Club, Inc., will hold the 18th annual Wabash Hamfest on Sunday, May 20, 1984, from 6:00 am to 4:00 pm, at the Wabash County 4-H Fairgrounds, State Route 13, Wabash IN. Donations are $2.50 in advance and $3.00 at the gate; advance reservations are requested. The flea market includes new and used gear in an unlimited outdoor area, and major vendors will be in an indoor area. There will be free overnight parking at the fairgrounds, local motel lodgings, and reasonably-priced food available. Talk-in on 147.63/.03, 146.52/.52, and 146.94/.94. For advance tickets, write Don Spangler W9HNO, 235 Southwood Drive, Wabash IN 46992, or phone (219)-563-5564.

FITCHBURG MA
MAY 20

The Montachusett Amateur Radio As-

sociation will hold an indoor flea market on Sunday, May 20, 1984, from 9:00 am to 3:00 pm, at the Fitchburg Civic Center, 1000 John Fitch Highway, Fitchburg MA. Admission is $1.00 and tables are $8.00 each. Doors will open for sellers at 8:00 am. Refreshments and plenty of free parking will be available. Talk-in on 145.45/.65 and 146.52. For space reservations, send a check payable to MARA to Jim Beauregard KB1AY, 7 Mountain Avenue, Fitchburg MA 01420.

PUTNAM CT
MAY 20

The Eastern Connecticut Amateur Radio Association will hold its 10th annual flea market on May 20, 1984, from 9:00 am to 2:00 pm, at the Elks Hall, Putnam CT. Tables are $7.00 in advance and $9.00 at the door. There will be good food and beverages. Talk-in on 147.225/.825 and .520. For further information and advance reservations, write Richard Spahl K1SYI, Lake Parkway, Webster MA 01570, or phone (617)-943-4420, or Donald Amirault K1APE, 66 Labonte Road, RR #1, Box 310, Thompson CT 06277, or phone (203)-923-2727.

KINGSTON ONT CAN
MAY 25-26

The Air Force Telecommunications Reunion to honor the 50th anniversary of Air Force communications will be held on May 25-26, 1984, at the Canadian Forces School of Communications and Electronics at Kingston. Reservations are $10.00 (refundable). This is a reunion of all who are serving or have served in the Air Force telecom world and their spouses. For more information, contact the Air Force Telecom Reunion Committee, CFB Kingston, Kingston, ONT K7L 2Z2. For reservations, send a check or money order to the same address.

KNOXVILLE TN
MAY 26-27

The Radio Amateur Club of Knox County will hold its 18th annual hamfest on May 26-27, 1984, at the Kerbella Temple Auditorium, just east of US 441 at the Tennessee River behind the Vol Inn Motel. The hours on Saturday will be from 9:00 am to 5:00 pm and on Sunday, from 10:00 am to 4:00 pm. Admission is $3.00. Features will include radio and computer forums, dealers, indoor and tailgate flea markets, and free parking. Talk-in on 147.90/.30. For more information, write Larry Poore N4EHR, 4320 Felty Drive, Knoxville TN 37918, or phone (615)-687-3154.

WEST FRIENDSHIP MD
MAY 27

The Maryland FM Association will hold its annual hamfest on Sunday, May 27, 1984, from 8:00 am to 4:00 pm, at the Howard County Fairgrounds in West Friendship MD (about 30 miles west of Baltimore on I-70). Admission is a $3.00 donation, tailgating is $3.00, and inside tables are $6.00 each in advance and $10.00 each on the day of the hamfest, if available. Commercial vendors must have proper tax-license certificates available and items offered for sale must be amateur-radio related. Talk-in on 146.16/.76 and 146.52. For table reservations or more information, write MFMA Hamfest Committee, c/o John Elgin WA3MNN, 8216 Styere Court, Laurel MD 20707, or phone (301)-821-2352.

BLACKSBURG VA
MAY 31-JUN 2

Virginia Polytechnic Institute and State University will hold a new workshop, Personal Computer and STD Computer Interfacing for Scientific Instrument Automation, on May 31-June 2, 1984, at Virginia Tech, Blacksburg VA. The workshop is $395.00 for the three days and will be directed by Mr. David E. Larsen, Dr. Paul E. Field, Dr. Jonathan A. Titus, and Dr. Christopher Titus. Each participant will wire and test interfaces. For more information, write Dr. Linda Leffel, CEC, Virginia Tech, Blacksburg VA 24061, or phone (703)-961-4848.

GUELPH ONT CAN
JUN 2

The Guelph Amateur Radio Club (VE3ZM) will hold the 10th annual Central Ontario Amateur Radio Flea Market and Computerfest on Saturday, June 2, 1984, from 8:00 am to 4:00 pm, at Regal Hall, 340 Woodlawn Road West, Guelph ONT. General admission is $2.00 and children 12 years and under will be admitted free. Vendors' admission is $5.00 per 8-foot space. Doors will be open to vendors only from 6:00 am and a quantity of 3' x 8' tables will be available for rental for $5.00 each. Features will include commercial displays, surplus dealers, computer software and hardware, indoor and outdoor displays, and a refreshment concession. Talk-in on 147.960/147.360 (VE3ZMG) and .52/.52 simplex. For further information, contact Susan Barabus VE3BEC or Joe Barabas VE3BXN at (519)-824-1404 (Guelph), Ralph Bartlett VE3BJX at (519)-836-2097 (Guelph), Henry Christiansen VE3BYU at (519)-743-9022 (Kitchener), Fred Hammond VE3HC at (519)-822-8323 (Guelph), or the Guelph Amateur Radio Club, PO Box 1305, Guelph ONT N1H 6N9, Canada.

ST. PAUL MN
JUN 2

The North Area Repeater Association will sponsor a swapfest and exposition for amateur-radio operators on Saturday, June 2, 1984, at the Minnesota State Fairgrounds, St. Paul. Admission is $4.00. There will be free overnight parking for self-contained campers on June 1st. Features will include exhibits, booths, and a giant outdoor flea market. Talk-in on .25/.85 and .16/.76. For more information, write Amateur Fair, PO Box 857, Hopkins MN 55343, or call (612)-420-6000.

PITTSBURGH PA
JUN 3

The 30th annual Breeze Shooters Hamfest will be held on Sunday, June 3, 1984, from 9:00 am to 4:00 pm, at the White Swan Amusement Park, PA Rte. 60 (Parkway West), near the Greater Pittsburgh International Airport. Registration is $2.00 or 3 for $5.00. Sheltered tables for vendors are available by advance registration only. Admission and flea-market spaces are free. There will be food available and activities will include the family amusement park. Talk-in on .28/.88 and 29 MHz. For further information, please write Don Myslewski K3CHD, 359 McMahon Road, North Huntingdon PA 15642, or phone (412)-863-0570.

ROME NY
JUN 3

The Rome Radio Club, Inc., will present the 32nd edition of its Rome Ham Family Day on Sunday, June 3, 1984, at Beck's Grove, Rome NY. Activities will include games, contests, educational and scientific displays and presentations, and a large flea market. Good food and beverages will be available throughout the day, which will be climaxed by a dinner and the Ham-of-the-Year award.

MANASSAS VA
JUN 3

The Ole Virginia Hams ARC, Inc., will hold the tenth annual Manassas Hamfest on Sunday, June 3, 1984, beginning at 8:00 am, at Prince William County Fairgrounds, VA Route 234, ½ mile south of Manassas VA. Admission is $4.00 per person (children under 12 will be admitted free) and there will be no advance sales. Activities will include 25 acres of tailgating (setups at 7:00 am), indoor commercial exhibits, breakfast and lunch menus, a YL program, and CW proficiency awards. Talk-in on 146.37/.97 WA4FPM (Manassas repeater) and 146.52 simplex. For more information, write Hamfest, c/o Ole Virginia Hams ARC, Inc., Manassas VA 22110, or phone (703)-361-9466.

CHELSEA MI
JUN 3

The Chelsea Swap and Shop will be held on Sunday, June 3, 1984, from 8:00 am to 2:00 pm, at the Chelsea Fairgrounds, Chelsea MI. The donation is $2.50 in advance and $3.00 at the gate. Children under 12 and non-ham spouses will be admitted free. Table space is $7.00 per 8 feet (ladies' tables welcome) and trunk sales are $2.00 per space; gates will open for sellers at 5:00 am. There will be plenty of parking, including special parking for the handicapped. Talk-in on 146.52 simplex and the 147.855 Chelsea repeater. For more information, write William Altenberndt WB8HSN, 3132 Timberline, Jackson MI 49201, or phone (517)-764-5785.

BOWLING GREEN KY
JUN 9

The Kentucky Colonel Amateur Radio Club will hold its 2nd annual hamfest on June 9, 1984, from 8:00 am to 3:00 pm, at the JC Pavilion at the Southern Kentucky Fairgrounds, Bowling Green KY. Tickets are $2.00 in advance and $3.00 at the door. Features will include an inside and outside flea market, inside displays of new equipment, food, free coffee, and free parking. Talk-in on 146.25/.85 and 146.52 simplex. For further information, write Ed Gann N4HID, Box 92, Route 19, Bowling Green KY 42101, or call (502)-843-8911.

KINGSTON PA
JUN 3

The Murgas ARC (K3YTL) will sponsor the annual Wilkes-Barre Hamfest on Sunday, June 3, 1984, beginning at 8:00 am, rain or shine, at the 109th Armory, Market Street, Kingston (across the river from Wilkes-Barre). Admission is $3.00; children under 16 and XYLs will be admitted free. There will be indoor and outdoor tailgating at $2.00 per space. Setups only will be at 6:00 am and tables and commercial power will be available. Talk-in on 146.01/.61 and .52 simplex. For further information, write Hamfest Committee, PO Box 1094, Wilkes-Barre PA 18703.

SOUTHINGTON CT
JUN 3

The Southington Amateur Radio Association will hold a flea market on Sunday, June 3, 1984, at the Central Elementary School, Main Street (Route 10), just outside Southington Center. Take exit 32 from I-84 to Route 10 south for 1.4 miles. The school is on the right, across from the Public Library. Admission is $1.00. Tables are $7.00 each in advance and $8.00 each at the door (no tailgating); two people will be admitted with each table purchased. There will be over 30 tables of new and used ham equipment, and hot coffee and refreshments will be available. Talk-in on 146.28/.88 and 145.550 simplex. For a table reservation, send an SASE and check (payable) to SARA, PO Box 284, Southington CT 06489.

PRINCETON IL
JUN 3

The Starved Rock Radio Club (W9MKS) will present its annual hamfest on June 3, 1984, at the Bureau County Fairgrounds in Princeton IL. Registration is $2.50 in advance (before May 20) and $3.00 at the gate. There will be a nominal fee for recreational vehicles. Features will include a free swap area, commercial vendor exhibits, an ARRL seminar, and plenty of parking. Good food will be available. Registrants will receive free coffee and doughnuts at 8:00 am. Talk-in on 147.12/.72, 146.07/.67, and 146.52 simplex. For advance registration or more information, send a large SASE to SRRC/W9MKS, RFD #1, Box 171, Oglesby IL 61348, or phone (815)-667-4614.

COEUR D'ALENE ID
JUN 9

The Kootenai Amateur Radio Society will sponsor Hamfest '84 on June 9, 1984, from 8:00 am to 4:00 pm, at the North Idaho Fairgrounds, Coeur D'Alene ID. Swap tables will be available at no charge; RVs are welcome but no hookups will be available on site. The annual Friday program will include a pot luck supper and dancing afterwards. For further information, write Avon Anderson WB7WBZ, N. 1035 Highland Court, Post Falls ID 83854.

WILLOW SPRINGS IL
JUN 10

The Six Meter Club of Chicago, Inc., will hold its 27th annual hamfest on Sunday, June 10, 1984, at Sante Fe Park, 91st and Wolf Road, Willow Springs IL (southwest of downtown Chicago). Registration is $2.00 in advance and $3.00 at the gate. Gates will open at 6:00 am and features will include a large swappers' row, displays in the pavilion, an AFMARS meeting, picnic grounds, refreshments, and plenty of parking space. Talk-in on 146.52 (K9ONA) and .37/.97 (K9ONA/R). For advance tickets, contact Val Hellwig K9ZWV, 3420 South 60th Court, Cicero IL 60650.

DEAL NJ
JUN 10

The Jersey Shore Chaverim will sponsor the third annual Ham & Computer Fest on June 10, 1984, from 9:00 am to 4:00 pm, at the Jewish Community Center, 100 Grant Avenue, Deal NJ (less than 50 miles from NYC and 70 miles from Philadelphia). Admission is $3.00 per person and children under twelve and XYLs will be admitted free. Indoor tables are $8.00 and tailgating spaces are $3.50 each. For reserved spaces, send an SASE and payment by June 1st to Jersey Shore Hamfest, PO Box 192, West Long Branch NJ 07764. Talk-in on 147.045 + .6, 145.110 − .6, and 146.52 simplex. For more information, call Arnold W2GDS at (201)-222-3009.

CORTLAND NY
JUN 16

The 2nd annual SARC Hamfest and

Flea Market will be held on Saturday, June 16, 1984, from 8:00 am to 5:00 pm, rain or shine, at the Cortland County Fairgrounds, Cortland NY (Exit 12 off I-81, midway between Syracuse and Binghamton). The donation is $2.00 and jr. ops under 12 and XYLs will be admitted free. Indoor tables and spaces are $3.00 each and undercover (pole-barn) spaces are $2.00 each. There will be indoor and outdoor flea markets, acres of free parking, and refreshments. Talk-in on .52 simplex. For table and space reservations, send a check to Elmer Fuller, Treasurer, 129 Chelsea Twins, Cortland NY 13045. For more details, contact Bud Jackson K2ZER, Skyline Amateur Radio Club, 8 Sunnyfield Drive, Cortland NY 13045.

FREDERICK MD
JUN 17

The Frederick Amateur Radio Club will hold its 7th annual hamfest on June 17, 1984, from 8:00 am to 4:00 pm, at the Frederick Fairgrounds. Admission is $3.00 and YLs and children will be admitted free. Tailgaters will be charged an additional $2.00; exhibitors' tables are $10.00 for the first and $5.00 for each additional one. Gates will open for exhibitors at 8:00 pm on June 16, 1984, and overnight security will be provided. Overnight parking will be welcomed. For further information, write Jim Devilbiss WA3FUJ, 915 Pine Avenue, Frederick MD 21701, or phone (301)-662-5784.

LAS VEGAS NV
JUN 21-24

The YL International Single Sideband System's annual convention will be held on June 21-24, 1984, at the Sahara Hotel, Las Vegas NV. Deluxe accommodations and RV parking are available for reasonable rates. Planned activities include a tour of Hoover Dam, a Lake Mead cruise, a gala stage show, a cocktail party, a banquet, and a breakfast buffet, as well as the DX forum and business meetings. YLRL ladies are invited to meet Thursday evening, June 21, at 8:00 pm. A convention station will be operating on 14,332 kHz. For complete details and a registration packet, send a business-size SASE (37¢ postage) to Jan Weaver N7YL, 2195 East Camero Avenue, Las Vegas NV 89123.

LIVONIA MI
JUN 29-30

The Livonia Amateur Radio Club will host the 1984 ARRL Michigan State Convention on June 29-30, 1984, on the campus of Schoolcraft College, 18600 Haggerty Road at Seven Mile Road, Livonia MI (22 miles northwest of downtown Detroit). Schoolcraft is easily accessible via Interstates 75, 275, 96, or 94. The Swap-N-Shop will be in the main gymnasium, and one of the two parking lots will be set aside for trunk sales. Major exhibitors will be in the swap area, if requested. Exhibitors' setups will be on Friday, June 29th, from 12:00 noon until 10:00 pm, and the displays will be open on Saturday, June 30th, from 8:00 am until 5:00 pm. There will be security provided on Friday night. For more information, write Wayne W. Wiltse K8BTH, General Chairman, 1984 ARRL Michigan Convention Committee, 14468 Bassett Avenue, Livonia MI 48154.

SWIFT CURRENT SASK
JUN 30

The Saskatchewan Hamfest will be held on June 30, 1984, in Swift Current SASK. Registration will be the evening before. Features will include contests, displays, a ladies' program, and a banquet. For more details, contact the Saskatchewan Hamfest Committee, Box 6, Swift Current SASK S9H 3V5, Canada.

OAK CREEK WI
JUL 7

The South Milwaukee Amateur Radio Club will hold its annual swapfest on Saturday, July 7, 1984, from 7:00 am to approximately 5:00 pm, at the American Legion Post #434, 9327 South Shepard Avenue, Oak Creek WI 53154. Admission is $3.00 per person and includes a "Happy Hour" with free beverages. Parking, a picnic area, hot and cold sandwiches, and liquid refreshments will be available. There will be free overnight camping. Talk-in on 146.94 MHz FM. For more details, including a local map, write South Milwaukee Amateur Radio Club, PO Box 102, South Milwaukee WI 53172.

BOISSEVAIN MAN CAN
JUL 14-15

The 21st annual International Hamfest will be held on July 14-15, 1984, at the International Peace Garden between Dunseith ND and Boissevain MAN. Activities will include transmitter hunts, mobile judging, and a CW contest. Excellent camping facilities will be available. For more information, contact William W. Bosch WD0EMY or Stanley E. Kittelson WD0DAJ, Box H, Dickinson ND 58801.

LOUISVILLE OH
JUL 15

The Tusco Amateur Radio Club (W8ZX) and the Canton Amateur Radio Club (W8AL) will present the 10th annual Hall of Fame Hamfest on Sunday, July 15, 1984, at the Nimishillen Grange, 6461 Easton Street, Louisville OH. Admission is $2.50 in advance and $3.00 at the gate. Tables are for rent on a reserved basis. Talk-in on 146.52/.52 and 147.71/.12. For reservations or more information, write Butch Lebold WA8SHP, 10877 Hazelview Avenue, Alliance OH 44601, or phone (216)-821-8794.

LAPORTE IN
JUL 15

The combined LaPorte-Michigan City Amateur Radio Clubs will sponsor their Summer Hamfest on Sunday, July 15, 1984, from 8:00 am to 2:00 pm, at the LaPorte County Fairgrounds, State Road 2, west of LaPorte IN. The donation is $3.00 at the gate. Good food, cold drinks, and paved outdoor parking will be available. For reservations for indoor tables (40¢/foot), write PO Box 30, LaPorte IN 46350.

GLACIER PARK MT
JUL 20-22

The Great Falls Area ARC will present the 50th annual Glacier-Waterton International Hamfest on July 20-22, 1984, at Three Forks Campground on the southern edge of Glacier National Park. Pre-registration is $8.50 and includes Saturday-night dinner (bring own meat and utensils) and Sunday-morning breakfast. Talk-in on .52 and .34/.94. For more information, send an SASE to Shirley Smith KC7OA, 1822 14th Avenue South, Great Falls MT 59405.

BEAVERTON OR
JUL 27-29

The Willamette Valley DX Club will hold the 1984 DX Convention on July 27-29, 1984, at the Greenwood Inn, Beaverton OR. For further information, write Bob Herndon W7XN, 607 Andover Place, Portland OR 97202, or phone (503)-232-2740.

HOUGHTON MI
JUL 28

The Copper Country Radio Amateur Association will host the 1984 Upper Peninsula Hamfest on July 28, 1984, at the Memorial Union Cafeteria on the campus of Michigan Technological University, Houghton MI. For further information, write Howard Junkin N8FHF, Co-Chairman, UP Hamfest, 106 West South Street, Houghton MI 49931, or phone (906)-482-4630.

WEST FRIENDSHIP MD
JUL 29

The Baltimore Radio Amateur Television Society (BRATS) will present the BRATS Maryland Hamfest and Computerfest on Sunday July 29, 1984, at the Howard County Fairgrounds, Route 144 at Route 32, adjacent to Interstate 70, West Friendship MD, about 15 miles west of the Baltimore Beltway (695). Table sales are by advance reservation only; indoor tables along the wall with ac are $20.00 each and indoor tables in the center of the floor without ac are $10.00 each. Quantity discounts and booths are available. There will be plenty of outdoor tailgating and RV hookups will be available. Dealer setups begin Saturday at 2:00 pm with overnight security provided. Talk-in on 146.76 (−600), 147.03 (+600), and .52 simplex. For table reservations and more information, write BRATS, PO Box 5915, Baltimore MD 21208, or call Mayer Zimmerman W3GXK at (301)-655-7812.

LAFAYETTE IN
AUG 19

The Tippecanoe Amateur Radio Association will hold its 13th annual hamfest on Sunday, August 19, 1984, beginning at 7:00 am, at the Tippecanoe County Fairgrounds, Teal Road and 18th Street, Lafayette IN. Tickets are $3.00. Features will include a large flea market, dealers, and refreshments. Talk-in on .13/.73 and .52. For advance tickets and more information, write Lafayette Hamfest, Route 1, Box 63, West Point IN 47992.

CHEROKEE OK
AUG 26

The 2nd annual Great Salt Plains Hamfest will be held on August 26, 1984, from 9:00 am to 5:00 pm, at the Community Building on the south side of the Great Salt Plains Lake in north-central Oklahoma. Features will include technical forums, organizationals meetings, free swap tables, refreshments, Novice exams, and a noon pot-luck dinner. Overnight camping and RV hookups are available at the Lakes State Park. Talk-in on the 147.90/.30 Salt Plains repeater. For more information, write Steven Walz WA5UTO, Box 222, Cherokee OK 73728, or phone (405)-596-3487.

PARAMUS NJ
OCT 14

The Bergen ARA will hold a Ham Swap 'n' Sell on October 14, 1984, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. There will be tailgating only; bring your own table. Admission for sellers is $4.00; buyers will be admitted free. Thousands of spaces will be available. Talk-in on .79/.19 and .52. For more information, write Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855, evenings only.

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WANTED—your unused Teletype™ repair parts. High prices paid! Send SASE for list of Teletypewriter parts and supplies. TYPETRONICS, Box 8873, Fort Lauderdale FL 33310; (305)-583-1340 after 9:00 pm. N4TT. BNB052

WANTED: Old keys for my telegraph and radiotelegraph key collection. Need pre-1950 bugs. All models of Vibroplex, Martin, Boulter, Abernathy, McElroy, etc. Also need Spark keys, Boston keys, large or unusual radiotelegraph keys, sideswipers, cooties, homebrew, and foreign keys. Neal McEwen K5RW, 1128 Midway, Richardson TX 75081. BNB063

WE ENJOY creating ham plaques, trophies, awards. Pse QSO. Prices, shipping—low. Care—free. J & J Trophy, Grove Street, Peterborough NH 03458; (603)-924-7804. BNB065

WANTED: Pre-1950 TV sets and old *TV GUIDE* magazines. W3CRH, Box 20-S, Macomb IL 61455; (309)-833-1809. BNB066

WANTED: Military surplus radios. We need Collins 618T, ARC-72, ARC-94, ARC-102, RT-712/ARC-105, ARC-114, ARC-115, ARC-116, RT-823/ARC-131 or FM622, RT-857/ARC-134 or Wilcox 807A, ARC-159, RT-1167 or RT-1168/ARC-164, RT-1299/ARC-186, RT-859/APX-72, APX-76, ARN-82, ARN-84, ARN-89, RT-804/APN-171, RT-829/APN-171, MRC-95, 718F-1/2, HF-105, Collins antenna couplers, 490T-1, 490T-2, 490T-9, CU-1658A/ARC, CU-1669/GRC, 490B-1, CU-1239/ARC-105, 490D-1. Top dollar paid or trade for new amateur gear. Write or phone Bill Slep, (704)-524-7519, Slep Electronics Company, Highway 441, Otto NC 28763. BNB071

1984 WIRE & CABLE prices cut!!! Call or write for latest listings. Certified Communications, "The CB to 10 Meter People," 4138 So. Ferris, Fremont MI 49412; (616)-924-4561. BNB073

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"FOOLPROOF LOGGING" program described in November, 1983, *73* magazine available for TRS-80 Model III, IBM PC, and CP/M-80 computers using Microsoft BASIC. $35.00 for diskette, manual, ppd. "Super-log" written in dBASE-II source code for almost any computer, $50.00. Specify disk format. Write for details. GRF Computer Services, 6170 Downey Avenue, Long Beach CA 90805. BNB079

DIGITAL DISPLAYS for FT-101s, TS-520s, Collins, Drake, Swan, and others. Write for information. Grand Systems, PO Box 3377, Blaine WA 98230; (604)-530-4551. BNB084

KV4/KP2 STATION, ST. THOMAS. Contests/DX/vacations, singles/clubs. Paul Murray WA2UZA, RD 4, Princeton NJ 08540; (201)-329-6309. BNB085

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EMERGENCY COMMUNICATIONS—An Organizational and Operational Handbook, by K3PUR. A complete reference guide for ARES/RACES and other public service groups, as reviewed in December '83 *QST* and January '84 *CQ*. $9.95 plus $1.50 P/H to: FDW Arts, 1394 Old Quincy Lane, Reston VA 22090 (VA residents, add 4% tax). BNB089

DX HEADING MAPS for Boston, NYC, Philadelphia, Baltimore, Detroit, Atlanta, Chicago, New Orleans, St. Louis, Dallas, LA. 11″ × 17″, $1.75 pp. 22″ × 34″, $5.95 pp. Specific city. Massey, PO Box 397, Hainesport NJ 08036; (609)-261-2952. BNB094

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ICOM SALE—IC-740 with PS-740, new condition, $850. IC-22A 2-meter transceiver with Hustler collinear antenna, $175. W. M. Stobbe W3KDT, 914 Plymouth Place, Turnersville NJ 08012. BNB109

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COLLINS 518F-2 ac power supplies for sale, $135, used, reconditioned. Also have a few with bad power transformers and bent cases that I will sell for parts. Collins 618S-1 aircraft radio, $200. Victor Frank K6FV, 12450 Skyline Blvd., Woodside CA 94062; (415)-851-1570. BNB111

FOR SALE: Tektronix 2215 oscilloscope, used once, $1200. RM1 Kevin Laman, PO Box 9058, NAS Key West FL 33040. BNB112

WANTED: Old keys for my telegraph and radiotelegraph key collection. Need pre-1950 bugs. All models of Vibroplex, Martin, Boulter, Abernathy, Shawplex, etc. Also need Spark keys, Boston keys, sideswipers, unusual keys, Omnigraphs, Cricket and Bunnell miniatures. Neal McEwen K5RW, 1128 Midway, Richardson TX 75081. BNB113

RADIO SPECIALTIES FM deviation scope —$250; Narda 8400 rf power meter, .01-12.4 GHz—$95; Singer M-19 spectrum analyzer, 1 kHz-25 MHz—$150. K8KZT, 2255 Alexander, Los Osos CA 93402. BNB114

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REPAIR, alignment, calibration. Collins written estimates, $25; non-Collins, $50. K1MAN, (207)-495-2215. BNB117

WANTED: Hallicrafters PS 150-120 power supply. For sale: Heathkit HP 23 power supply. Send SASE. R. Goodpaster, 415 Harmon Hts., Stanford KY 40484. BNB118

HAM HELP

I am looking for a 3-inch-square meter that was used in the Collins 302C3 wattmeter. Also a Collins 75S3A.

Max R. Otto W0LFF
733 West Benton Street
Iowa City IA 52240

I am requesting any information on Tesla coils. I need this for a science project. Any articles on how to build a Tesla coil will be greatly appreciated.

Kent Barrett
141 Gatone Drive
Hendersonville TN 37075

I am looking for a synthesizer compatible with a Heathkit HW-202 2m FM transceiver. Xtals are Freq./24 for Tx and Freq. – 10.7/3 for Rx. I am also looking for a Drake FS-4 synthesizer. Any manuals available for such devices would also be appreciated.

Allen Cole N4JRI
PO Box 11282
Richmond VA 23230-1282

Regarding CB to 10 meters: I would like information on the conversion of a Pace-Sidetalk 1000M.

L. Latham N5FJK
2500 Flamingo Lane
Altus OK 73521

I need a schematic or other info for a Simpson 260 series 5 and series 3A, RCA WV77E, and EICO 232. I will pay shipping and copying costs.

Fred "Al" Wasielewski WA2VJL
PO Box 1382
San Benito TX 78586

Hammarlund HX-50 or 50A SSB transmitter: Looking for info on 160-meter kit, part #PL26880-G1 or G2, which adds 160 meters to this rig. Will consider junked HX-50 or 50A with 160 meters installed, as parts source.

John F. Sehring WB2EQG
PO Box 1872
Wayne NJ 07470

Need schematic and/or manual for AM-COM S 2-25 2m xcvr. Will pay all expenses.

Manos G. Darkadakis SV1IW
Box 23051
112 10 Athens, Greece

I am looking for help with the problem of interfacing a Heath SS-9000 transceiver with a VIC-20 or Commodore 64. I have an RS-232 interface on the computer and have configured it as follows:

RS-232 Serial Output to Soutput on 9000
RS-232 Serial Input to Sinput on 9000
Request to send to Clear to send on 9000
Data terminal ready to Data set ready on 9000
Data set ready to Data terminal ready on 9000
Signal ground to signal ground

I am using Victerm 1 software, and needless to say, this configuration is not working. I live on the desert here in California and am about 150 miles from San Diego and 200 miles from Los Angeles. There are no users groups anywhere around this area, so I don't know where to turn for help.

I am willing to pay any reasonable charge for help with this matter.

Dick Ham N6IUK
PO Box 1014
Brawley CA 92227

I would like to contact other hams who have what I term "sophisticated" computerized RTTY—programs that emulate fancy dedicated equipment (e.g., Hal 3100, etc.) and allow mailbox ops, the sending of a file to/from disk, etc. Info on such programs and their resident computers and required interfacing would be most greatly appreciated.

I am interested both for my own personal info (i.e., purchase) and because there is no single source of data on what is available for which computer and what the capabilities and limits are. I intend to compile and publish that source.

John Palesa WB9JPH/5
314 Cedar Bend Drive
Midwest City OK 73130

I need a schematic for a Commodore VIC-20 computer. I'll pay any reasonable charge.

Warren J. Koppy WB0KIS
903 Mound Street
St. Paul MN 55106

I need a schematic for a Radio Mfg. Engineers, Inc., serial no. CM1 receiver. I will pay for copying costs.

Ron Janeshek
RD #1
Bulger PA 15019

DR. DIGITAL

Robert Swirsky AF2M
PO Box 122
Cedarhurst NY 11516

CHOOSING A PROGRAMMING LANGUAGE

Computer users are always debating which programming language is best. In my opinion, it is impossible to say which one is "best." While I tend to use PL/I-80 by Digital Research for most of my programming needs, I certainly would not use it for everything. For some applications, particularly for short programs that are used once to perform a mathematical calculation, Basic is the best choice. For many amateur-radio and electronics applications, programs are written and run only once to calculate a particular value. Once the needed value is obtained, the program will never be run again.

The traditional way of comparing languages is through the use of a benchmark—taking the same algorithm and translating it into a number of different languages. The execution times (how long it takes to run) are then compared and the fastest one is considered the best. Unfortunately, this method doesn't take the amount of time needed to *write* the program into account. Also, some languages are fast while doing one type of calculation and slow for another. PL/I-80 provides a good example of this! For binary calculations it is extremely fast, but when dealing with BCD or floating-point numbers, it creeps.

To demonstrate that execution times alone are not a good way of comparing languages, I have put together a benchmark comparison of 7 programming languages: four versions of Basic and one each of Pascal, PL/I-80, and Cobol. In this comparison, I have recorded the amount of time it took to write the program, from the moment I sat down at the keyboard to the end of the first working run. I also did another sneaky thing: I purposely chose a problem that is not efficiently calculated in microcomputer implementations of Pascal, PL/I, and Cobol.

Basic

The Basics I used were Applesoft, Microsoft Basic-80 (running under a 2-MHz CP/M system), Atari Basic, and T.A.S.C. (a compiled Applesoft marketed by Microsoft). The program, which calculates the sum of the integers from 1 to 1000, is shown in Listing 1. Line 10 is there to permit timing—timing starts when RETURN is hit in response to the INPUT statement and stops when the result appears on the display. (In the Atari version, I added "5 DIM A$(1)". This was needed because Atari Basic handles strings differently.)

Writing time for Applesoft, Microsoft, and Atari Basics were close, at 38, 44, and 50 seconds respectively. Execution times were 3.71 seconds for Applesoft, 6.01 seconds for Microsoft Basic-80, and 5.75 seconds for Atari Basic. It is interesting to note that although the Atari's 6502 MPU runs at 1.8 MHz as compared with Apple's 1.024-MHz clock, Atari Basic is *slower* by a factor of 84%. This example shows that CPU speed isn't always a good criterion with which to compare computers.

T.A.S.C., which stands for The AppleSoft Compiler, had a "writing time" of 2 minutes, 7 seconds. The extra time is because the compiler checks the program's syntax and converts it to machine language *before* any code is actually executed. In contrast, Basic interpreters (i.e., Applesoft) check syntax and execute the code a line at a time. Benefits are realized at execution time; the program took only 1.56 seconds to execute—237% faster than Applesoft and 385% faster than Microsoft Basic-80!

```
10 INPUT A$
20 FOR X = 1 TO 1000
30 S = S + X
40 NEXT X
50 PRINT S
```

Listing 1. Basic.

```
PROGRAM ADD;

   VAR SUM:INTEGER[6];
       IDX:INTEGER;
       X   :CHAR;


  BEGIN (*ADD*)

    READLN (X);

    SUM := 0;

     FOR IDX := 1 TO 1000 DO
        SUM := SUM + IDX;

    WRITELN (SUM)

  END.
```

Listing 2. Pascal.

```
add:proc options (main);


   dcl x fixed decimal (10,0);
   dcl sum fixed decimal (10,0);
   dcl f char(1);


   get list (f);
   sum = 0;

   do x = 1 to 1000;
    sum = sum + x;
   end;

   put skip list (sum);
end add;
```

Listing 3. PL/I-80.

```
IDENTIFICATION DIVISION.
PROGRAM-ID. ADD.
ENVIRONMENT DIVISION.
DATA DIVISION.
WORKING-STORAGE SECTION.
77 IDX PICTURE 9999.
77 SUM PICTURE 999999.
77 X   PICTURE X.
PROCEDURE DIVISION.
BEGIN.
    ACCEPT X.
    MOVE ZERO TO IDX.
    MOVE ZERO TO SUM.
    PERFORM ADD-PAR UNTIL IDX = 1001
    DISPLAY SUM.
    STOP RUN.
ADD-PAR.
    COMPUTE SUM = SUM + IDX.
    ADD 1 TO IDX.
```

Listing 4. Cobol.

Which Basic is best? Certainly, the compiled version is the fastest as far as execution time. However, it took much longer to get the program ready for execution. For this reason, when writing a program to perform a calculation that has to be done once, a compiled Basic is not worth the extra effort. On the other hand, if you have to do a few hundred calculations, the additional speed would be an advantage.

PL/I, Pascal, and Cobol

Because they are compiled, PL/I, Pascal, and Cobol would suffer from the same disadvantages as T.A.S.C. This is not too surprising. What is surprising is that all three of them were slower in *execution* speed than Applesoft Basic. In fact, PL/I and Cobol were slower than Basic-80.

Listing 2 shows the Pascal version of the program. Notice that it took 11 lines as compared to Basic's 5 lines, making it 220% longer. It took 5 minutes, 7 seconds to write, compile, and run the program; execution time alone was 4.52 seconds. The version of Pascal I used was UCSD Pascal version 1.1 running on a 2-MHz Z-80 computer. UCSD Pascal is not a true compiler. It converts the program into an intermediate language called P-code, which is then interpreted.

Don't get the idea that Pascal isn't a good language. It contains many features that would be difficult, if not impossible, to code in Basic. It also allows for elaborate records, structures, and sets. Unlike Basic, it is a fairly standard language. I can give the program in Listing 2 to almost any Pascal compiler and it would run with no difficulty.

PL/I-80 produced some disappointing results (Listing 3). It took 4 minutes, 49 seconds to write, compile, link, and run the program. Execution time alone was 8.13 seconds, slower than the slowest Basic (Basic-80) in our benchmark.

The PL/I-80 compiler is marketed by Digital Research and is my favorite microcomputer language. It is not efficient when calculating fixed-point binary numbers—usually about 35 times faster than the best Basics. Unfortunately, fixed-point binary numbers must be in the range of −32788 to +32787. This is not enough for our benchmark program, which produces a result of 500500. The size of this result forced me to use fixed decimal numbers (which are not computed as efficiently), slowing the program down considerably.

Another factor that slowed PL/I-80 is the nature of the language. PL/I-80 allows mixing of types. For example, the statement T=T+'1' is perfectly valid—the string constant '1' is converted into a number and added to T. The ability to convert from one type (string) to another type (numeric) adds considerable overhead to PL/I programs and, not surprisingly, slows them down. It is these same time-wasting features that can be lifesavers in many programming applications and make for more efficient programs.

The slowest language in our benchmark is Cobol-80 made by Microsoft. Cobol is a business language and is best at file handling and printing tables of decimal numbers. Speed in calculation is not one of Cobol's strong points.

Writing, compiling, linking, and running the Cobol program in Listing 4 took 9 minutes and 27 seconds. Execution time alone was 22.45 seconds—373% slower than the Basic-80 and 1439% slower than T.A.S.C. It is clear that Cobol-80 is not a good choice for numerical calculation. However, when working with data files or printing out financial reports, paychecks,

PC-1 - TRS 80 - POCKET COMPUTER.
33 SECONDS. X = 1 TO 1000

✓See List of Advertisers on page 114

or accounts receivable, it is a good choice.

Conclusions

Which language is best? As you can see, it is hard to answer that question. You've probably heard that Pascal is "better" than Basic, or that PL/I-80 is the fastest compiled language for microcomputers, but as you can see from benchmark results, this is not always the case. In general, for a long program, PL/I or Pascal will execute faster than any Basic. However, when writing a program to do a specific mathematical calculation, Basic is often the best choice. It is certainly quicker to get a Basic program running than a PL/I program—no compiling or linking is necessary.

Incidentally, the best choice is sometimes no computer program at all! Let's take another look at the problem solved by our benchmark program: finding the sum of the numbers from 1 to 1000. The program calculates this by adding 1 + 2 + 3 + 4 + . . . + 1000. However, it can also be looked at as adding (1000 + 1) + (999 + 2) + (998 + 3) + . . . + (501 + 500). You'll notice that the number within the parentheses always adds up to 1001, and you are adding this to itself 500 times. By multiplying 1001 by 500, which can easily be done in one's head, one comes up with 500500. The same method can be used to find the sum of any other series of numbers. For example, the sum of the integers from 1 to 250 is equal to 251 times 125, or 31375.

When I first discussed programming languages a few months ago, I was surprised by the amount of interest the subject generated; my post-office box was overflowing! I hope this column clears up some of the mystery surrounding the various languages available to the microcomputer user.

SATELLITES

Amateur Satellite Reference Orbits

	Date	OSCAR 8 UTC	OSCAR 8 EQX	RS-5 UTC	RS-5 EQX	RS-6 UTC	RS-6 EQX	RS-7 UTC	RS-7 EQX	RS-8 UTC	RS-8 EQX	Date
May	1	0021	101	0110	70	0156	88	0022	60	0139	73	1
	2	0025	102	0104	70	0141	86	0013	59	0136	74	2
	3	0029	103	0059	70	0125	83	0003	58	0133	75	3
	4	0034	104	0054	71	0110	81	0152	87	0130	76	4
	5	0038	106	0048	71	0054	79	0143	86	0128	76	5
	6	0042	107	0043	71	0039	76	0133	85	0125	77	6
	7	0047	108	0038	71	0024	74	0123	84	0122	78	7
	8	0051	109	0032	71	0008	72	0114	83	0119	79	8
	9	0055	110	0027	72	0152	99	0104	82	0116	80	9
	10	0100	111	0021	72	0136	97	0054	82	0113	80	10
	11	0104	112	0016	72	0121	95	0045	81	0111	81	11
	12	0108	113	0011	72	0105	92	0035	80	0108	82	12
	13	0113	114	0005	72	0050	90	0026	79	0105	83	13
	14	0117	116	0000	73	0035	88	0016	78	0102	84	14
	15	0121	117	0154	103	0019	85	0006	77	0059	85	15
	16	0126	118	0149	103	0004	83	0156	106	0056	85	16
	17	0130	119	0144	103	0147	110	0146	105	0054	86	17
	18	0134	120	0138	103	0132	108	0136	104	0051	87	18
	19	0139	121	0133	103	0116	106	0127	103	0048	88	19
	20	0000	96	0128	104	0101	103	0117	103	0045	89	20
	21	0004	98	0122	104	0045	101	0107	102	0042	89	21
	22	0009	99	0117	104	0030	99	0058	101	0039	90	22
	23	0013	100	0112	104	0015	96	0048	100	0037	91	23
	24	0017	101	0106	104	0158	124	0038	99	0034	92	24
	25	0022	102	0101	105	0142	122	0029	98	0031	93	25
	26	0026	103	0056	105	0127	119	0019	97	0028	94	26
	27	0030	104	0050	105	0112	117	0010	96	0025	94	27
	28	0035	105	0045	105	0056	115	0000	95	0022	95	28
	29	0039	107	0040	105	0041	112	0149	125	0020	96	29
	30	0043	108	0034	106	0025	110	0140	124	0017	97	30
	31	0048	109	0029	106	0010	108	0130	123	0014	98	31
Jun	1	0052	110	0024	106	0153	135	0120	122	0011	98	1
	2	0056	111	0018	106	0138	133	0111	121	0008	99	2
	3	0101	112	0013	106	0122	130	0101	120	0005	100	3
	4	0105	113	0007	107	0107	128	0051	119	0003	101	4
	5	0109	114	0002	107	0052	126	0042	118	0000	102	5
	6	0114	115	0156	137	0036	123	0032	117	0157	133	6
	7	0118	117	0151	137	0021	121	0022	117	0154	133	7
	8	0122	118	0146	137	0005	119	0013	116	0151	134	8
	9	0127	119	0140	137	0149	146	0003	115	0148	135	9
	10	0131	120	0135	138	0133	144	0153	144	0145	136	10

FREE SATELLITE PREDICTION BULLETINS

Free satellite-orbit-prediction charts are available from NASA on the following amateur-radio satellites (NASA Identification Number is in parentheses): OSCAR 9 (1981-100B), RS-3 (1981-120A), RS-4 (1981-120D), RS-5 (1981-120C), RS-6 (1981-120F), RS-7 (1981-120E), RS-8 (1981-120B), and OSCAR 10 (1983-58B).

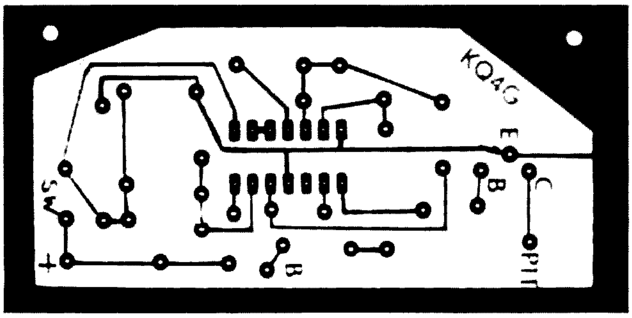
In order to fully understand the bulletins, ask for the "Format Explanation of the NASA Prediction Bulletin." Also request the "Map Overlay Method of Hand Computing Station Predictions." This will show you how to determine viewing angles and times from your station.

Send your request to: R. V. Tetrick, Head, Project Operations Branch, NASA, Goddard Space Flight Center, Greenbelt MD 20771. (Thanks to Carl S. Zelich AA4MI for this information.)

CORRECTIONS

Herewith a revised negative for the circuit board in the article ("Build the NASA Beeper") which I sent to you and which was published on page 88 of the March, 1984, issue of *73*. In checking the proofs of the board, I inadvertently compared it to a different earlier negative which was in error. Please accept my apologies.

Nicholas Van de Sande KQ4G
Arden NC



HAM HELP

I want a program for a Commodore 64 where I can put in my latitude and longitude and the other station's latitude/longitude and get the other station's distance in miles.

I have tried converting programs for this written for the Radio Shack models 1 and 3, Heath, and Hewlett-Packard 9845 and cannot get any to run. Also, one written for the VIC-20 didn't work either.

Gary Payne KE6CZ
1347 E. Dakota
Fresno CA 93704

I need the schematic and operating manual for the Knight TR-106 6-meter transceiver with the model V-107 remote vfo. Any help will be appreciated.

P. J. Mikula KA8RZL
70 Clay St.
Manistee MI 49660

I want someone to have a sked with me to increase my CW speed. Must use keyboard and start at 25 wpm. For more info, call (304)-983-2157.

Roger Vankirk KX8Y
Rt. 2, Box 388X
Morgantown WV 26505

I would like to hear from anyone who has modifications to put the Ten-Tec Omni on 10-meter FM.

Stephen J. O'Malley N2CLE
140-26 Poplar Ave.
Flushing NY 11355

I need help on the Galaxy (Hy-Gain) R-530 solid-state general-coverage receiver. The phase-lock oscillator is not working. I need any information on parts sources, alignment/troubleshooting data, or individuals who can repair. If anyone wants to start an R-530 club or newsletter or knows of same, contact me.

Jim Turner K5YZS
103 Karla Drive
Whitehouse TX 75791

I need a service manual or schematic or copy of same for a Yaesu FM FT-202R handie-talkie. Also need crystals for 2 meters or charger.

Cyril T. Wolff WA7LOV
S. 5507 Marshall Road
Spokane WA 99204

I need a schematic and operation manual for DuMont 274 scope. I will gladly pay copying costs and postage.

Robert A. Johnson N7CFX
833 E. Gwinn Pl.
Seattle WA 98102

I have recently purchased a Radio Shack TRS-80 model 100 and would like to know if there is any ham software available for it commercially. I am particularly interested in any CW send/receive and RTTY software and would appreciate having the names of any companies that might have such systems.

Information about software for other computers that run Basic would even be helpful, as I think that I could adapt it for the model 100.

David C. Eanes N4AZI
4866 Drusilla Lane
Baton Rouge LA 70809

Wanted: bfo transceiver for a Hammarlund SP-600-JX-1 s/n 4528 (R274C/FRR 650), part number 31160-1. Also have a box of coils for National RAO-6 which I will donate to the first taker.

Peter Doherty W1UO
PO Box 291
Port Townsend WA 98368

About 25 years ago, Emerson (I believe) came out with a portable radio powered by batteries and/or a built-in solar cell. They only made a few. (I wonder why?) It worked well with both sun and artificial light. I would like the name and address of the manufacturer since I want one of these old radios.

O. R. Estrada
1866-48th Ave.
San Francisco CA 94122

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

TEN-METER FM AWARDS

Sponsored by the North Whidbey Island Repeater Association (NWIRA).

All contacts, to be valid, must have been made on or after January 1, 1981. Crossmode contacts do not count. Contacts must be 2-way ten-meter FM.

Special endorsements can be made for all-mobile, all-simplex, and single-frequency accomplishments and contacts made within a single day, week, month, or year.

Note: Members of the NWIRA monitor 29.600 MHz, as well as the area repeater on 29.640 MHz (an 1800-Hz tone or whistle is required to access).

Do not send QSL cards! Forward your list of contacts showing the date, time, and frequency of each QSO and provide a brief station description, along with the fee of $4.00 for each award to: Ten-Meter FM Awards Program, 2665 North Busby Road, Oak Harbor WA 98277.

Worked All Districts Award

To qualify, applicants must work one ten-meter FM station in each of the ten US call districts.

Worked All States Award

Applicants must work a minimum of fifty US states on ten-meter FM.

Centurion Award

This award requires the applicant to work a minimum of 100 stations on ten-meter FM.

DX Decade Award

Applicants must work a minimum of ten DX stations outside the fifty US states and Canada on ten-meter FM.

North American Award

To qualify, applicants must work all ten US call districts, a minimum of six Canadian provinces and/or territories, and at least four DX countries within the North American continent (other than the US and Canada) on ten-meter FM.

OPERATING ACHIEVEMENT AWARDS FROM *A5 MAGAZINE*

Fast-Scan ATV Award

"Getting the amateur television station operating is an award in itself!" This award certificate recognizes the "first" amateur television two-way contact. Endorsements for DX mileage and color ATV are available. Contacts via ATV repeaters are allowed. Award inscriptions are made around the border of the *A5* block. Black and white, 8" × 10".

Master Scanner *A5* SSTV Award

This award certificate recognizes the serious SSTVer. Entry level is 100 two-way SSTV contacts. Endorsements for 500, 1000, 1500, 2000, etc., are available. Special endorsement for color SSTV is available with verified print copy. A must for every SSTVer! Gold, 8" × 10".

Specialized Communications Achievement Award

This award recognizes accomplishments in ATV, MSTV, NBTV, SSTV, fax, RTTY, EME, microwaves, and satellites. Entry levels are contacts over 100 miles on ATV. Special-event ATV projects, 25 DX country contacts on SSTV, reception of HF MSTV or fax signals via amateurs, microwave DX, 10 DX foreign countries via EME, 10 two-way contacts on an amateur satellite, and 25 DX countries on RTTY are required, with special endorsements available for additional contacts. Certificates are numbered as received; They are gold, 8" × 10", and suitable for framing.

Worked All States SSTV

Work all 50 states (including Hawaii and Alaska) with exchange of callsign and signal report in video. A special WAS map is available to color in the states as you get them. This is an ongoing award not limited to the annual contest. Special endorsements are available for multiband WAS.

Worked All States RTTY

Work all 50 states (including Hawaii and Alaska) with log copy verification. This is an ongoing award not limited to the annual contest. Special endorsements are available for multiband WAS.

Good Image Award

Awarded at the Dayton Hamvention each year, the Good Image Award is presented to the individual or group of individuals who contributed to the advancement of the *A5* code of communication by technical achievement or public awareness. Top-of-the-line award!

All *A5 Magazine* awards require subscription-label information date codes. Enclose $1.00 for the cost of the award certificate and 50 cents postage for return mailing (envelope is provided). Allow 2-3 weeks for verification and mailing. Send all requests to Awards Manager, *A5 Magazine*, PO Box H, Lowden IA 52255-0408. Winners of awards will be published on a regular basis in *A5 Magazine*.

CENTRAL STATES VHF SOCIETY OPERATING AWARDS

At the 1981 Central States VHF Conference in Sioux Falls, South Dakota, in August, the Central States VHF Society formally announced its new operating awards program with three colorful awards for VHF/UHF/SHF bands.

Each award was designed to stimulate activity on the bands above 144 MHz. The differences in the awards as well as the variety of endorsements available provide challenging but achievable goals regardless of the station's geographic location or capabilities.

The awards are open to all amateurs—not just CSVHF Society members. To receive rules and application sheets, send a legal-size SASE (with two stamps) to Bob Taylor WB5LBT, 10715 Waverland, Baton Rouge LA 70815.

General Rules—All Awards

The awards described below are available to all amateurs worldwide who submit details of the required contacts (on the separate award application detail sheet) and have the accuracy of the application certified by a local member in good standing of the CSVHF Society. In addition to the basic awards, certain optional endorsements are available as described below and on the application cover sheet.

For all awards, direct two-way communication must be established on amateur-radio bands of 144 MHz and above. Minimum contact requirements are the exchange of callsigns and signal reports (or other mutually understood information) and receipt of acknowledgement that both stations have received this information. All contacts for each award must be on the same band.

Contacts must be made from the same location or from other location(s) licensed to the application, no two of which are more than 50 miles apart.

Contacts for the VUCC and WHG awards may be made over any period of years, with no starting date, but numbered certificates will be issued only to those who have made the required contacts after August 1, 1981. 1K Coverage Award contacts must be made during any two consecutive months after August 1, 1981.

Contacts made through "repeater" devices or any other power-relay method do not count toward any of the awards. In addition, no crossband contacts are permitted.

False statements on the application cover sheet or on the detail sheet(s) shall result in immediate disqualification for any of the awards.

Remember, you do not have to be a member of the CSVHF Society to apply for an award. However, if you wish to join, send the $5.00 membership dues to: Ted Mathewson W4FJ, CSVHF Society Secretary, 1525 Sunset Lane, Richmond VA 23221. Please do not send dues with awards applications.

VUCC

The VUCC (VHF/UHF Century Club) award simply requires contacts with 100 different amateur stations. Optional endorsements for working additional stations in increments of 25 (e.g., 125, 150, 175, etc.) or for making all the contacts during a single calendar year (Jan. 1 through Dec. 31) are available only if all the contacts were made on the same mode of propagation (sporadic E skip, EME, meteor scatter, or aurora).

1KCA

The 1K Coverage Award requires contacts of sufficient number and distance such that the sum of the QSO points for all the contacts during each of any two consecutive calendar months is equal to or greater than 1000. The QSO points for any given contact are the band points multiplied by the distance points. The band points are determined as follows: 144 = 2, 220 = 5, 432 = 4, 1295 = 5, 2300 = 10, 3300 = 15, 5650 = 25, and 10 GHz and up = 50. The distance points are simply the number of 1-degree-by-1-degree "grids" (see definition under WHG Award) you are away from the other station's 1-degree-by-1-degree grid. For example, if the station is in the next grid over from yours, the distance point for the contact is 1; if it is two grids over, the distance points are 2, etc. Contacts in your own grid have a distance point value of 1. For stations which are not in a grid directly north, south, east, or west of yours (i.e., off at an angle), the distance points have to be calculated. In such cases, the distance points are equal to the square root of the sum of the latitude difference squared and the longitude difference squared, where the differences in latitude and longitude are measured in numbers of whole 1-degree-by-1-degree grids. The resulting distance points are to be rounded off to the nearest tenth. Only one contact with a given station per GMT day counts toward this award, and EME contacts do not count. There are no additional endorsements available for this award.

WHG

The WHG (Worked Hundred Grids) award requires contacts with stations in 100 different 1-degree-by-1-degree geographic grids. The grids are defined as the area bounded by integral values of latitude and longitude. For example, a station whose longitude is 112 degrees 32 minutes 15 seconds west and latitude is 37 degrees 25 minutes 16 seconds north would be in the grid 112W37N. All stations are urged to include their latitude and longitude and/or equivalent recognized QTH locator code on their station cards to assist others in determining their grid. If you have to determine the other station's grid yourself, it can be done easily by looking up the town location in any good road atlas and then locating the position on a larger map which shows the 1-degree lines of latitude and longitude. Two such maps are listed here:

1. "Map 2-A" comes in two halves (54" × 80" assembled) and is available for $3.00 postpaid from: Branch of Distribution, US Geological Survey, Federal Center, Denver CO 80225. Shown are counties, county seats, capitals, and cities larger than 500,000.

2. Rand McNally's "Contemporary United States" measures 36" × 54" and is available through bookstores for $2.95. The map does not show counties but does include major highways, a number of cities and towns, and 3 degrees more latitude in Canada than the USGS map.

Optional endorsements are available for working additional 1-degree-by-1-degree grids in increments of 25 (e.g., 125, 150, 175, etc.) or for working all the different grids in a single calendar year.

MARCO POLO

We are proud to announce that the Catanzaro, Italy, chapter of ARI, Associazione Radioamatori Italiani, issues an international DX award called Marco Polo, in order to commemorate the long and difficult travels of this Italian explorer throughout Asia, starting from Venice in the XIII century.

This award is available to any OM/SWL who is a member of the IARU section of his own country and exemplifies the ham spirit through a reenactment of the trail of Marco Polo over the airwaves, by establishing contacts with the various areas mentioned or crossed by the famous Venetian.

A brief summary of the rules is listed below. The cost is $4.00 plus $1.00 for mail coverage; endorsements cost $1.00. For a complete copy of the rules or any inquiries, contact Award Manager I8QLI, Gianni Verdegiglio, PO Box 19, 88100 Catanzaro, Italy.

We think that a large number of DX hunters will be interested in qualifying for this diploma. This award requires skill, diligence, and unrelenting effort in pursuing by radio the ancient trail of Marco Polo. Here's hoping that this award will enhance your pleasure for DX.

Summary of the Rules

1. This award is available to any OM/SWL member of an IARU chapter.

2. The contacts must be established with countries described by the Venetian explorer Marco Polo in his book, *Il Milione* (*The Million*)—see box, following page.

3. All modes are valid, except crossband.

4. Only one QSO will be considered for each country; the operations must be valid for DXCC, in accord with the rules of ARRL.

5. Various scores are attributed to differ-

LIST OF COUNTRIES—MARCO POLO AWARD

Areas or Countries	Prefixes	Points
Central Greece	SV4	4
Israel	4X, 4Z	1
Syria	YK	4
Iraq	YI	4
Iran	EP	4
Turkey	TA	3
Armenia	UG8	3
Azerbajian	UD6	1
Georgia	UF8	1
Turkoman	UH8	2
Uzbekh	UI8	2
Tadzhik	UJ8	2
Kirghiz	UM8	3
Alma Ate	UL7G	3
Mongolia	JT	7
China	BY	15
Taiwan	BV	10
Djibouti	J2	2
Masai	5H3 or 5Z4	3
Madagascar	5R	8
Kuangtung	CR9 or VS6	8
South Korea	HL	2
Japan	JA	1
Malaya	9M2 or 9V1	5
Bay of Bengal	XZ or S2	10
Siam Gulf	HS or XU	5
Tibet and Hymalaya	9N or A51	10
India (less Gujarat)	VU	2
Gujarat (West India)	VU	8
Sri Lanka	4S7	2
Sumatra	YB4, 5, 6	2
Borneo	YB7 or VS5 or 9M6, 8	6
Java	YB0, 1, 2, 3	2
Yemen area	4W or 7O	8
Oman	A4X	3
Persian Gulf	A6, A7, A9, 9K or HZ	4
Ethiopia	ET	10
Somalia	T5, 6O	7
Zanzibar, Pemba	5H1	7

ent countries, in order to remark the skill or the interest: countries referred to same geographical area are scored only once (see list).

6. Contacts are valid starting from January 1, 1978.

7. The award is issued in five classes: 1. Base award, at least 60 points—3-color diploma; 2. Silver award, at least 80 points—3-color diploma, shield; 3. Gold award, at least 95 points—3-color diploma, shield; 4. Honor Roll, at least 110 points—3-color diploma, medal; and 5. Top Honor Roll, at least 125 points—3-color diploma, medal. Endorsements are available each year for class enhancement.

8. QSO listed with band, mode, date, and GMT and signed by at least two hams that are members of DXCC or WAZ must be sent to Award Manager I8OLI, Gianni Verdegiglio, PO Box 19, 88100 Catanzaro, Italy. QSL front/back photocopies are accepted in substitution of signatures; however a list must be provided.

9. The cost of each class of diploma is $5.00 ($4.00 plus $1.00 for mail coverage). Any endorsement must be accompanied by a new general list, number of diploma, and $1.00 plus SAE.

10. The award manager may request original material or photocopies to confirm validity.

11. Alterations, false declarations, or other irregular operations will be considered cause for disqualification.

12. Inquiries should be addressed to ARI, Council of Chapter, Box 200, 88100 Catanzaro, Italy. No other judgment will be considered.

ONTARIO BICENTENNIAL AWARD

Sponsored by the Radio Society of Ontario, Inc. Contacts valid only for January 1 to December 31, 1984.

VE3 Stations

Contact 200 different VE3 or portable VE3 stations. One point each.

Other VE, VO, VY

Stations contact 100 different VE3 or portable VE3 stations. Two points each.

DX Stations Including USA

Contact 20 different VE3 or portable VE3 stations. Ten points each.

Any mode or band endorsed at your wish. Special seals for each 200 extra points. If VE3 stations are using special call or prefix, they count double. No QSL cards necessary. Send certified log data and $1.00 or 3 IRCs to: VE3LSS, Bicentennial Project, Listowel District Secondary School, Geography Department, Listowel, Ontario, Canada N4W 2M4.

1984 Special-Event Stations

VE3SAS—St. Catharines, Ontario, Canada, bicentennial station. QSL via Dave Digweed VE3FOI, 12 Frederick Street, St. Catharines, Ontario, L2S 2S2.

VE3VM—August 4, 5, and 6, special operation from Burgyon Woods, St. Catharines, Ontario, by members of Niagara Peninsula ARC. QSL to PO Box 692, St. Catharines, Ontario, L2R 6Y3.

USA amateurs can use US stamps on SASE, mail will be sent from Niagara Falls NY USA; this is for special-event stations only.

ARMED FORCES DAY 1984 "MEETING THE CHALLENGE"

This year's observance of Armed Forces Day, set for Saturday, May 19, marks the 35th anniversary of communications tests between amateur-radio operators and military communications systems. Since 1950, this event has been scheduled during the month of May and has emphasized a continuing climate of mutual assistance and warm esteem.

Featured highlights of the nationwide celebration are the traditional military-to-amateur crossband communication test and a message-receiving test. The crossband test will include operations in continuous wave (CW), single sideband voice (SSB), radioteletype (RTTY), and slow-scan television (SSTV). The receiving test consists of two special Armed Forces Day messages from the Secretary of Defense, one transmitted using the CW mode followed by the second transmitted in the RTTY mode.

These tests give both amateur-radio operators and shortwave listeners (SWLs) the opportunity to demonstrate their individual technical skills. Special commemorative acknowledgement (QSL) cards will be awarded to those amateur-radio operators achieving a verified two way radio contact with any of the participating military radio stations. Interception of these contacts by SWLs is not acknowledged by QSL cards, however, anyone who receives and accurately copies the Armed Forces Day CW and/or RTTY message from the Secretary of Defense can qualify to receive a special commemorative certificate from the Secretary.

Crossband Contacts

The military-to-amateur crossband operations will be conducted from 19/1300 UTC to 20/0245 UTC, May, 1984. East-coast stations commence operations at 19/1300 UTC and west-coast stations commence operations at 19/1800 UTC, May, 1984. Military stations will transmit on selected military frequencies and listen for amateur-radio stations on those portions of the amateur bands as indicated in Table 1. The military operator will announce the specific amateur-band fre-

Station	Military Frequency	Emission	Amateur Band
AIR	4025 kHz	LSB	3800-4000 kHz
2045th	6995.5 kHz	CW	7025-7150 kHz
Communication Group	7308.5 kHz	RTTY	7080-7100 kHz
Andrews Air Force Base	7315 kHz	LSB	7225-7300 kHz
Washington DC	13988.5 kHz	RTTY	14080-14100 kHz
	13997.5 kHz	CW	14000-14150 kHz
	14408 kHz	USB	14150-14350 kHz
NAM	14400 kHz (see operating schedule below)		
Naval Communication			
Area Master Station LANT			
Norfolk VA			

14400 Operating Schedule

Emission	Time	Amateur Band
CW	1300-1700	14000-14150 kHz
RTTY	1700-2200	14080-14100 kHz
USB	2200-0245	14150-14350 kHz

Station	Military Frequency	Emission	Amateur Band
NAV	7372.5 kHz	RTTY	7080-7100 kHz
HQ Navy-Marine Corps	14389.5 kHz	SSTV	14225-14235 kHz
MARS			
Radio Station			
Cheltenham MD			
NMH	4015 kHz	CW	3500-3750 kHz
Coast Guard Radio Station	7348.5 kHz	LSB	7225-7300 kHz
Alexandria VA	14440 kHz	RTTY	14080-14100 kHz
	20937.5 kHz	USB	21250-21450 kHz
NMN	7393 kHz	CW	7025-7150 kHz
Coast Guard Communication Station			
Portsmouth VA			
NPG	4001.5 kHz	LSB	3800-4000 kHz
Naval Communication	4010 kHz	CW	3500-3750 kHz
Station	8970 kHz	CW	3500-3750 kHz
Stockton CA	7301.5 kHz	LSB	7225-7300 kHz
	7385 kHz	CW	7025-7300 kHz
	9991.5 kHz	CW	10100-10150 kHz*
	13927.5 kHz	RTTY	14080-14100 kHz
	13975.5 kHz	CW	14000-14150 kHz
	14385 kHz	USB	14150-14350 kHz
	20998.5 kHz	CW	21025-21250 kHz
*Except 10109-10115 kHz	21480 kHz	USB	21250-21450 kHz
NPL	7380 kHz	RTTY	7080-7100 kHz
Naval Communication	14375 kHz	SSTV	14225-14235 kHz
Station			
San Diego CA			
NZJ	7375 kHz	RTTY	7080-7100 kHz
Marine Corps Air Station	14480 kHz	USB	14150-14350 kHz
El Toro CA			
WAR	4028.5 kHz	LSB	3800-4000 kHz
HQ Army MARS	6997.5 kHz	CW	7025-7150 kHz
Radio Station	13992.5 kHz	USB	14150-14350 kHz
Fort Meade MD	14403.5 kHz (see operating schedule below)		
	20995.5 kHz	USB	21250-21450 kHz

14403.5 Operating Scehdule

Emission	Time	Amateur Band
RTTY	1300-1500, 1800-2200, 0100-0245	14080-14100 kHz
CW	1500-1800, 2200-0100	14000-14150 kHz

Table 1.

quency being monitored. Duration of these contacts should be limited to three minutes.

CW Receiving Test

The CW receiving test will be conducted at 25 words per minute. The broadcast will be a special Armed Forces Day message from the Secretary of Defense to any amateur-radio operator or shortwave listener desiring to participate. A 10-minute call for tuning purposes will begin at 20/0300 UTC, May, 1984. The Secretary's message will be transmitted at 20/0310 UTC, May, 1984 from the stations on the frequencies listed in Table 2.

Radioteletypewriter Receiving Test

The radioteletypewriter receiving test will be transmitted at 60 words per minute using 170 Hertz (narrow) shift. A 10-minute call for tuning purposes will begin at 20/0335 UTC, May, 1984. The special Armed Forces Day message from the Secretary of Defense will be transmitted at 20/0345 UTC, May, 1984. Transmission will be from the same stations on the same frequencies as previously listed for the CW receiving test.

Submission of Test Entries

Transcriptions of the CW and/or RTTY receiving tests should be submitted "as received." No attempt should be made to correct possible transmission errors. The time, frequency, and callsign of the military station copied as well as the name, callsign, and address (including zip code) of the individual submitting the entry must be indicated on the page containing the test message. Each year, a large number of acceptable entries are received with insufficient information or the necessary information is attached to the transcription and is separated, thereby precluding the issuance of a certificate. Entries must be postmarked no later than May 26, 1984, and submitted to the respective military commands as follows:

Stations copying AIR send entries to: Armed Forces Day Test, 2045CG/DONJM, Andrews AFB DC 20331.

Stations copying NAM, NAV, or NPG send entries to: Armed Forces Day Test, HQ Navy-Marine Corps MARS, 4401 Massachusetts Ave. NW, Washington DC 20390.

Stations copying WAR send entries to: Armed Forces Day Test, Commander, 7th Signal Command, ATTN: CCN-PO-OX, Fort Ritchie MD 21719.

Transmitting Station	Frequency (kHz)
AIR 2045th Communication Group Andrews Air Force Base Washington DC	6995.5, 13997.5
NAM Naval Communication Area Master Station LANT Norfolk VA	4005, 7393, 14400
NAV HQ Navy-Marine Corps MARS Station Cheltenham MD	7372.5, 14389.5
NPG Naval Communication Station Stockton CA	4010, 7365, 13927.5
WAR US Army MARS Radio Station Fort Meade MD	4028.5, 6997.5, 14403.5

Table 2.

GLOUCESTER COUNTY NJ

The Gloucester County Amateur Radio Club will operate W2MMD from 1700Z May 4 to 1700Z May 5, to commemorate the club's 25th anniversary. Phone operation in lower portion of General-class bands 10-80, and CW in Novice bands. Commemorative certificate by QSL to GCARC, PO Box 370, Pitman NJ 08071.

SUN DAY

The Florida Solar Energy Center (FSEC) of the State University System of Florida and the Indian River Amateur Radio Club will celebrate Sun Day on May 5 and 6, 1500Z to 2200Z. 5,880 photovoltaic 4-inch-diameter solar cells will provide for heating, cooling, cooking, and amateur-radio operations during this public event, Sun Day.

W4NLX/4 will operate on SSB—7.240, 14.240, 21.370, and 28.518; CW—7.040, 14.040, 21.040, and 28.003; and FM—146.28/.88. A beacon will be on 1296.05 MHz.

For all shortwave listeners and amateur-radio operators, *The Solar Collector*, a quarterly high-technology newsletter, is available free, on request. Also, a multicolor certificate is available. Send a business-size SASE to: FSEC, 300 State Road 401, Cape Canaveral FL 32920.

BALLOON RACE

The Alamance Amateur Radio Club (K4EG) will be operating a special-event station, May 12 and 13, from the site of the Regional Hot Air Balloon Race, Burlington, North Carolina. Each day's operation will be from 1100 to 2200 UTC. Frequencies of operation will be 10 kHz inside the lower General phone portion of 40 and 15 meters, and 7.125 kHz and 21.130 kHz in the Novice bands. An attractive commemorative QSL will be issued to all stations worked for a QSL and an SASE. QSL to: Alamance Amateur Radio Club K4EG, PO Box 3064, Burlington NC 27215.

DOGWOOD FESTIVAL

Fairfield, Connecticut: The Greater Fairfield ARA will operate WB1CQO from 1300 to 2200 UTC, May 12, during the annual Dogwood Festival. A certificate is available for an SASE. Frequencies: 3.975, 7.235, 14.330, 21.420. Contact: Jerry C. Melson KE1A, Greater Fairfield Amateur Radio Association, PO Box 1364 SM, Fairfield CT 06430.

ARMED FORCES DAY AT WEST POINT

On May 12 and 13, 1984, The Meadowlands Amateur Radio Association will be operating at the United States Military Academy at West Point, New York, in honor of Armed Forces Day 1984.

The club will be operating under the club station call N2BMN. Operation will be from 1400Z to 2000Z UTC, May 12, and from 1400Z to 1700Z UTC, May 13. Frequencies will be: SSB—14.310, 7.250, 144.225, and 50.125 MHz, FM—146.550 MHz.

Send a large SASE with $.37 US postage to accommodate an 8½" × 11" certificate of confirmation of QSO to: PO Box 324, Little Ferry NJ 07643.

US AIR FORCE MUSEUM

To celebrate the observance of Armed Forces Day, the United States Air Force Museum will, for the second time, host the operation of an amateur-radio special-event station.

To be housed in the Museum's WWII Nissen Hut, participants will operate under the callsign K8DMZ from 1400Z to 2200Z, Saturday, May 19. Amateur-radio operators will work primarily in General-class phone segments of 75, 40, 20, 15, and 10 meters with periodic excursions to the Novice subbands. FM and SSB operation on the 144-, 220-, and 432-MHz bands is also planned. The specific frequencies to be used will depend upon existing band conditions. To commemorate the event, the museum will issue a special certificate for each two-way contact.

The largest and oldest military aviation museum in the world, the Air Force Museum is located six miles northeast of Dayton at historic Wright-Patterson Air Force Base.

BIG RED ONE

On May 19 and 20, 1984, Armed Forces Day Weekend, the Wheaton Community Radio Amateurs, Inc., will conduct a special event from the First Infantry Division Museum, Cantigny, in Wheaton, Illinois.

The special-event call will be N9BRO. The 24-hour-long event will be on all bands, beginning at 1700Z (GMT) May 19, 1984. Frequencies will be 50 kHz up from the bottom of the General phone bands, 25 kHz up from the bottom of the General CW bands, and 25 kHz up from the bottom of the Novice bands. RTTY on 146.70 simplex, 14.087, and 21.087. 2 meters on 147.54 simplex. Certificate via WCRA, PO Box QSL, Wheaton IL 60189. $1 or 5 IRCs.

ARMED FORCES DAY

In recognition of the 35th annual Armed Forces Day celebration, amateur-radio station W4ODR, located aboard Naval Air Station Memphis, Millington, Tennessee, will be operating on Saturday, May 19, from 1400Z to 2200Z. Plans call for operation on 7.230 (± 10 kHz). CW frequency will be 21.145. 146.52 will be the 2m frequency. It is hoped that operation will be continuous on all bands, but check all frequencies to be sure. Special certificates and QSL cards will be available to those who work W4ODR. QSL to amateur-radio station W4ODR, PO Box 54278, Millington TN 38054. A brief description of the Navy Memphis complex follows.

The 3,400-acre Navy Memphis complex is located 13 miles north of Memphis, Tennessee, and five miles east of the Mississippi River. NAS Memphis is the home of the Chief of Naval Technical Training (CNTECHTRA) and the Naval Air Technical Training Center (NATTC).

CNTECHTRA administers the technical training program for the entire US Navy. Training conducted under the auspices of CNTECHTRA begins with the basic training for all Navy recruits and officer candidates. It continues through various levels of technical skills training and includes instruction for the highly advanced technicians who maintain and operate the extremely technical and sensitive devices found on the Navy's aircraft, ships, and submarines.

Over 3,000 Navy courses of instruction are conducted throughout the command's network of 58 schoolhouses, located at 27 different installations, stretching from the east coast to the west coast, the Great Lakes to the Gulf of Mexico, and across the Pacific to Hawaii. The coordination, supervision, planning research, and guidance for these courses take place at the Millington-based headquarters.

NATTC is the largest single command in the Navy Memphis complex with over 40 different courses of instruction. It stands some 10,000 strong, including students, instructors, and support personnel. The training center's mission is to train selected Navy and Marine aviation personnel in aeronautical technical phases of naval aviation and other related subjects as directed by the Chief of Naval Operations.

PORTSMOUTH SEAWALL FESTIVAL

Portsmouth, Virginia: The Portsmouth ARC will operate W4POX at the Portsmouth Seawall Festival at Portside, May 26, 27, and 28, 1500-2200Z. Frequencies will be around 7230 and 14.290 MHz. For special commemorative QSL, send your card and SASE to: W4POX, PO Box 8503, Portsmouth VA 23703. For QSL and a large commemorative certificate, send your card and a 9" × 12" envelope with two units of first-class postage.

WINO WEEKEND

The Wireless Institute of Northern Ohio (WINO), an organization sponsored by the Lake County Amateur Radio Association, will be on the air with a special-event station to commemorate Ohio Wine Week on Saturday, June 2, and again on Sunday, June 3. On Saturday evening we will be operating between 7 and 11 pm EDST (2300Z June 2 to 0300Z June 3) on 3910 MHz and 7235 MHz. On Sunday afternoon we will be on between 11 am and 4 pm EDST (1500Z to 2000Z) on 7235 MHz and 21380 MHz. The station will be located at an actual winery in Madison, Ohio, and will use the call KO8O. A special 8½" by 11" QSL certificate will be available from: KO8O—WINO Weekend, 7128 Andover Drive, Mentor OH 44060, for a legal-sized SASE.

FAR SCHOLARSHIPS

The Foundation for Amateur Radio, Inc., a nonprofit organization with headquarters in Washington DC, plans to award 15 scholarships for the academic year 1984-85. The foundation, composed of fifty local-area amateur-radio clubs, fully funds two of these scholarships from the proceeds of its annual hamfest. It administers, without cost to the donors, three scholarships for the Quarter Century Wireless Association, two for the Dade (FL) Radio Club and one each for the Radio Club of America, the Richard G. Chichester Memorial, the Young Ladies' Radio League, the Edmund B. Redington Memorial, the Amateur Radio News Service, the Columbia (MD) Amateur Radio Association, the Baltimore (MD) Amateur Radio Club, and the Lewis G. Wilkinson Memorial.

Licensed radio amateurs may compete for one or more of these awards if they plan to pursue a full-time course of studies beyond high school and are enrolled or have been accepted for enrollment in an accredited university, college, or technical school. Most of the scholarships require the applicant to hold at least an FCC General-class license or equivalent. The scholarship awards range from $350 to $900 with preference given in some cases to residents of specified geographical areas or the pursuit of certain study programs.

Additional information and an application form can be requested by a letter or QSL/postcard, postmarked prior to May 31, 1984, from: FAR Scholarships, 6903 Rhode Island Avenue, College Park MD 20740.

The foundation is devoted exclusively to promoting the interests of amateur radio and to those scientific, literary, and educational pursuits that advance the purposes of the Amateur Radio Service.

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

LATE SPRING QRP SSB ACTIVITY WEEKEND
May 5-6

This is one of several QRP activity weekends held throughout 1984 by the G-QRP-Club of England. The events are intended to promote QRP activity at the times and on the frequencies suggested. Members from other QRP clubs throughout the world and all amateurs interested in QRP are invited to join in at the following times and frequencies:

Times (GMT)	Frequencies
0900-1000	14285
1000-1100	21385/28885
1100-1200	7090
1200-1300	3690
1300-1400	14285
1400-1500	3690
1500-1730	21385/28885
1730-2000	14285
2000-2100	7090
2100-2200	3560
2200-2300	14285

Remember this is an SSB activity and many of the suggested frequencies are outside the USA bands.

FLORIDA QSO PARTY
1400 to 1900 GMT May 5
0001 to 0500 GMT May 6
1500 to 2300 GMT May 6

This is the 18th annual Florida QSO Party sponsored by *Florida Skip*. All amateurs worldwide are eligible and invited to participate. All amateur bands may be used, 160 through 2 meters. All stations will separate phone and CW logs; phone and CW are separate contests. A station may be worked once on each band on each mode. Neither crossband nor crossmode contacts will count for contest credit. Florida stations may work other Florida stations, but for contest points only. Out-of-state stations may not work each other for contest credit. Contacts made on repeaters do not count for credit.

Florida stations will be divided into two classes. Class-A stations are those operating portable or mobile on emergency power and running 100 Watts or less output inside Florida but outside of their home counties. Class-B stations are *all* other stations operating in Florida. Entrants may be single-operator or multi-operator and this must be indicated on the summary sheet.

Each entrant agrees to be bound by the provisions of the contest announcement, the regulations of the applicable licensing authority, and the decisions of the *Florida Skip* Contest Committee, which are final.

EXCHANGE:

Florida stations send RS(T) and county of operation. Others send RS(T) and US state, Canadian province, or country.

FREQUENCIES:

Phone—3945, 7279, 14279, 21379, 28579, 50.2, 146.52.

CW—3555, 7055, 14055, 21055, 28055.

SCORING:

Florida stations count one point per QSO with out-of-state or other Florida stations. Multiplier is the sum of states (49 max.), provinces (12 max.), and DX countries (27 max.) actually worked; maximum multiplier is 88. Others count 2 points per QSO with each Florida station. Multiplier is the number of different Florida countries worked (67 max.). Final score is the product of QSO points and the multiplier. Class-A stations *only*, multiply score by 1.5 to obtain final total.

AWARDS:

Certificates for phone and CW to the top single operator score in each state, province, DX country, and Florida county. Multi-operator winners will receive certificates as activity justifies. There are also 5 plaques to be awarded as follows: high single operator in Florida and out of state, CW and phone, and the Florida club with the highest aggregate score. A minimum of 25 contacts must be made to be eligible for a certificate.

ENTRIES:

Phone and CW entries are to be *separated!* Along with legible logs in chronological order, a summary sheet is required with each entry. The summary sheet must contain score, number of QSOs, multiplier, station callsign, entry class, number of Florida counties, power source (for Class-A entries), county, state, province, country, or region of operation, callsigns of all operators/loggers if multi-op, name of club if part of a club aggregate score, name and address *typed or printed in block letters*, and a signed declaration that all rules and regulations have been observed. All stations making more than 200 QSOs must also include a dupe sheet. Sample summary and log sheets are available for an SASE from the QTH below.

At the discretion of the contest committee, stations and/or operators may be disqualified for improper reporting, excessive dupes, errors in multiplier lists, unreadable logs, obvious cheating, etc. All entries must be received on or before June 3. Mail all entries to: *Florida Skip* Contest Committee, c/o Florida Amateur Radio Society, PO Box 9673, Jacksonville FL 32208.

MICHIGAN QSO PARTY
1800 GMT May 19 to
0300 GMT May 20
1100 GMT May 20 to
0200 GMT May 21

This year's QSO party will be sponsored by the Oak Park ARC. Phone and CW are combined into one contest. Michigan stations can work Michigan counties for multipliers. A station may be contacted once on each band/mode. Portables/mobiles may be counted as new contacts each time they change counties.

EXCHANGE:

RS(T), QSO number, QTH as state, country, or Michigan county.

FREQUENCIES:

Phone—1815, 3905, 7280, 14280, 21380, 28580.

CW—1810, 3540, 3725, 7035, 7125, 14035, 21035, 21125, 28035, 28125.

VHF—50.125, 145.025, 146.52.

SCORING:

Multipliers are counted only once. Michigan stations score 1 point per phone QSO and multiply by the total number of states, countries, and Michigan counties. Each CW contact counts 2 points; KL7 and KH6 count as states; VE counts as a country. Maximum multiplier is 85.

Others, take QSO points times the total number of Michigan counties. QSO points are 1 point per phone QSO, 2 points per CW QSO, and 5 points for each club-station contact with W8MB. Maximum multiplier is 83.

VHF only entries: same as above except multipliers per VHF band are added together

RESULTS
SARTG WORLDWIDE RTTY CONTEST 1983

Class A—Single Operator		
1.	ON4UN	567,000
2.	UT5RP	307,230
3.	SM6ASD	263,885
4.	DK8NG	249,165
5.	HB9HK	220,950
Class B—Multi-Operator		
1.	OH0TTY	344,960
2.	OH2TI	219,550
3.	OH2AH	70,750
4.	OK3KGI	44,390
5.	HA3KHB	6,555
Class C—SWL		
1.	OZ-DR 2135	270,500
2.	Y2-2814/M	123,370
3.	OK1-23185	105,560
4.	NL-4483	86,790
5.	FE-3700	68,735
Top Americans		
10.	KA3GIK	116,250
12.	W4CQI	105,600
13.	KB2VO	105,525
19.	K6WZ	44,490
20.	WB4VBD	44,200
Top American SWL		
7.	J. Mathews	41,850

CALENDAR

May 5-6	Late Spring QRP SSB Activity Weekend
May 5-6	Florida QSO Party
May 19-21	Michigan QSO Party
Jun 9-10	ARRL VHF QSO Party
June 23-24	ARRL Field Day
Jul 13-15	*A5* International SSTV DX Contest
Aug 4-5	ARRL UHF Contest
Aug 11-12	New Jersey QSO Party
Aug 18-19	SARTG Worldwide RTTY Contest
Aug 24-27	*A5* North American UHF FSTV DX Contest
Sep 8-9	ARRL VHF QSO Party
Sep 15-17	Washington State QSO Party
Sep 22-23	Late Summer QRP CW Activity Weekend
Oct 6-7	ARRL QSO Party—CW
Oct 13-14	ARRL QSO Party—Phone
Nov 3-4	ARRL Sweepstakes—CW
Nov 17-18	ARRL Sweepstakes—Phone
Dec 1-2	ARRL 160-Meter Contest
Dec 8-9	ARRL 10-Meter Contest
Dec 26-Jan 1	QRP Winter Sports—CW

THE LCARA PATCH
NEWSLETTER OF THE MONTH

THE LCARA PATCH is another fine example of the outstanding newsletters being produced every month by ham organizations around the world. Featuring club news and meeting minutes, excerpts from *The Westlink Report* and the *W5YI Report*, DX and FCC news, and much more, the February issue (for example) contained 40 different articles. Congratulations, Editor Gary Knelsley KC8GN!

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

for total multiplier. No repeater contacts are allowed.

AWARDS:

Plaques to Michigan entries with high multi-operator/single-transmittar score, high Michigan score, high Michigan (Upper Peninsula) score, high aggregate club score, high VHF only (100 QSOs minimum), high mobile, and high out of state. Certificates to high score in each county with a minimum of 50 QSOs. Out-of-state certificates for high score in each state and country.

ENTRIES:

A log and summary sheet are requested showing the scoring and other pertinent information, name and address in *block letters*, and a signed declaration that all rules and regulations have been observed. Michigan stations include club name for combined club score. Party contacts do not count toward the Michigan Achievement Award unless one fact about Michigan is communicated. Members of the Michigan Week QSO Party Committee are not eligible for individual awards. Decisions of the Contest Committee are final. Results will be final on July 30th and will be mailed to all entries. Mailing deadline is June 30. Entries should be sent to: Mark Shaw K8ED, 3810 Woodman, Troy MI 48084.

MICHIGAN ACHIEVEMENT AWARD

This will be the 26th year that hams have had their own program to publicize Michigan and its products. Just as for the past years, the governor will award Achievement Certificates to hams who take part in telling the world of Michigan's unlimited resources, opportunities, and advantages. Certificates are awarded on the following bases:

1. A Michigan ham submits log information and names and addresses (if possible) of 15 or more contacts made to out-of-state or DX hams with information regarding Michigan.

2. An out-of-state ham, including Canada, submits log information and names and addresses (if possible) of at least 5 Michigan hams who relate facts to him about Michigan.

3. A foreign ham, excluding any resident of Canada, submits the call letters and name and address plus log information for at least one Michigan ham who has told him about Michigan.

Only QSOs made during Michigan Week, May 19-26, will be considered valid. All applications for certificates must be postmarked by July 1 and mailed to: Governor James Blanchard, Lansing MI 48902.

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

INTO THE ARCHIVES

The other day, while rummaging through the KI2U archives, I came across a facsimile of an ARRL membership application, circa 1914. Did you know that one had to apply for ARRL membership back in the old days? Shows you how standards have dropped. These days, the ARRL even accepts people like me and AF2M.

At any rate, I thought it might be fun to fill in the application and send it back to the League along with my renewal check. Herewith, the ARRL's questions and my responses:

Your name: Ah, an easy question. J. J. Edwards.

Address: Another easy one. PO Box 73, Middle Village NY 11379. My QTH is a little cramped, but the address has a nice ring to it.

Your age: I'm beginning to get touchy about questions like this. Twenty-nine. Really!

Your station call letters: KI2U. Hope they don't mind the number.

Length of your aerial? Which one? Let's see, the boom on my HF beam is about 13 feet long.

Do you obtain your power from batteries or city current? It depends. My HT uses batteries.

Do you use a spark coil or transformer? Strange question. Most of my power supplies have transformers, I think.

What is your approximate receiving range in miles? Hmmm. I didn't get to hear W5LFL, but I have worked EME. Let's say 500,000 miles, give or take a few hundred thousand.

Are you troubled by interference? You bet. My Apple generates a torrent of RFI. Next question.

Have you telephone connection in your house, or convenient? In my house, not my convenient.

Do you keep your station practically constantly in running order? Yes, my station is practically running.

Here's hoping my answers help make a better ARRL.

ELEMENT 1 MULTIPLE CHOICE

1) In a folded dipole:
   1) Current in all conductors are in phase
   2) Current in all conductors are out of phase
   3) Current exists only in the dielectric
   4) Height is rarely important
2) A quarter-wave transformer is:
   1) A quality detector
   2) Also known as a "Q" section
   3) May be used as an inductance transformer
   4) Used only with coaxial feedline
3) A fishbone is a:
   1) Dipole
   2) Traveling-wave antenna
   3) Helical antenna
   4) Type of receiver
4) The antenna used by Marconi to receive the first transatlantic radio signals was held aloft by a:
   1) Balloon
   2) Building
   3) Man
   4) Kite
5) A "capacitance hat" is most often used on:
   1) Cubical quads
   2) Yagis
   3) Dipoles
   4) Whip antennas

ELEMENT 2 TRUE-FALSE

		True	False
1)	All Apple IIs come equipped with a Z80 microprocessor.	___	___
2)	CP/M was the first microcomputer language.	___	___
3)	That fellow in the IBM Personal Computer ads is supposed to be Charlie Chaplin.	___	___
4)	The Z80, Z80A, and Z80H microprocessors are all made by Zilog, Inc.	___	___
5)	The 6502 is made by Intel.	___	___
6)	The floppy disk was invented by IBM.	___	___
7)	VisiCalc is an integrated software package.	___	___
8)	A "mouse" is computer slang for a programming error.	___	___
9)	The term "byte" is a contraction of the words "binary" and "digit."	___	___
10)	FORTRAN is a business-oriented language.	___	___

ELEMENT 3 FILL IN THE BLANK

1) Most solid-state Class C amplifiers are operated with both base and _______ leads connected to ground.
2) S-meter readings are purely _______.
3) "Rushbox" was the name given to a rig with a _______ receiver.
4) Dr. Carl Zenar invented the _______.
5) CMOS: complementary-symmetry, metal-oxide _______.

ELEMENT 4 SCRAMBLED WORDS

Unscramble these words dealing with packet radio.

lanterml	doen	drrehawa
erawtosf	verscetrina	loip
shandhkea	mearf	glipdaerte
coprolto		

THE ANSWERS

Element 1:
1—1, 2—2, 3—2, 4—4, 5—4.

Element 2:

1—False A 6502. Of course, you can always buy a Z80 co-processor board.
2—False CP/M is an operating system, not a language.
3—False IBM says it's not Charlie, but "Everyman." Could have fooled me.
4—True Eight-bit favorites.
5—False By Motorola. A name that's somewhat familiar to hams.
6—True Who else?
7—False It's just a plain, old, electronic spreadsheet.
8—False It's an input device—like a keyboard or joystick.
9—False But "bit" is.
10—False FORTRAN is a language aimed at scientific applications. COBOL is for business.

Element 3:
1—emitter
2—relative
3—superregenerative
4—zener diode
5—silicon

Element 4:
terminal, node, hardware; software, transceiver, poll; handshake, frame, digipeater; protocol.

SCORING

Element 1:
Five points for each correct answer.
Element 2:
Two and one-half points for each correct answer.
Element 3:
Five points for each correct fill-in.
Element 4:
Two points for each word correctly unscrambled.

So, how did you do?

1-20 points—Poor
21-40 points—Fair
41-60 points—Good
61-80 points—Better
81-100+ points—Bingo!

HAM HELP

I am looking for any amateur-radio-related programs for the Timex/Sinclair 1000 computer. I also need a schematic for a Hallicrafters Commander Thirty-Two UHF high-band transceiver.

Scott Harvey KA7FVV
N. 5011 Idaho Rd.
Newman Lake WA 99025

In August, we are spending our third holiday in your wonderful country. As we have done before, we are requesting a couple of nights of hospitality in New York. This is our first visit to the city, but we have made good friends in Washington and LA through this unorthodox method. Hospitality will of course be reciprocated in our home, which is convenient for Scotland and Hadrian's Wall and on a direct route to London.

We are in our late thirties and very easy to get on with. We happen to prefer meeting people informally to staying in impersonal hotels.

Michael is a licensed ham, a computer engineer, and a soaring instructor. I am a final-year student doing social work. We love cats and have no feeding problems or peculiarities. In fact, we are a thoroughly nice couple. All letters will be replied to.

Pat and Michael Stott
"Wellview"
12 Caste View
Ovingham
NE42 8AT
England
Phone: 0661 32020

Wanted: manual or any information on a WRC-1 transmitter/receiver.

Tommy Norris KA4RKT
Rte. #1, Box 412
Auburn KY 42206

I hear that the Standard SR-C146-A hand-held can be modified from two to four Watts output via a circuit modification. Anyone having information to this effect, please advise.

Ted Allan WB3CVN
11 Panarth Road
Bala-Cynwyd PA 19004

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 6

have to have some system for getting Novices to keep on moving their code speed up until it reaches at least 35 per. It means making sure that we don't let a few lazy hams reflect badly on all of us by letting their code speed slip just because they spend most of their hamming time rag-chewing on phone or working RTTY. None of us wants to see that happen, right?

One possible way to help all of us keep our code speed up, even if we do spend a good deal of time on phone, might be to require all operators to exchange callsigns only on CW, even for phone contacts. After all, RTTY operators for many years had to send their calls on CW before and after each transmission. We could go further and make it illegal to give your call on voice. I'd like to see someone put that into a petition and send it to the FCC as part of the obviously needed beefing-up of code.

You know, if we don't outlaw repeating the callsign on voice, we could see many ops putting the CW identification on a ROM chip at 100 wpm, operated by the mike button. Could we even outlaw the use of computers to decipher the callsigns sent on CW? Why not?

The more we encourage amateurs to use computers and code keyboards, the more likely we are to have amateurs getting lazy about their code speed. Also, if any of the FEMA or CD crowd get a taste of high-speed digital communications, we're going to have a hard time getting them to let us use Morse code for emergencies. Best we do what we can to discourage RTTY, ASCII, packet radio, and other systems which do not depend entirely on the code skills of licensed amateurs. We sure don't want any unlicensed operators putting us out of work in emergencies—not even after WTCAD.

Computers and keyboards are pernicious things, automating communications and taking it out of the hands of us, er, amateurs. The ARRL has been fighting RTTY for the last thirty years—obviously going along with the main line of amateur convictions.

Okay, what should we do next? I've already proposed a little rule change to the FCC which I feel is necessary if we are going to make sure that none of the old-timer hams lets his code speed slip. Perhaps the next step is to get a bit more spectrum for CW communications. Wouldn't it be great if we could put the 40m band back the way it was 50 years ago? That used to be strictly a CW band in those days. And you didn't hear any foreign broadcast stations there, either. It wasn't until we opened 40m to phone communications that they were able to creep in. Now they've just about squeezed amateurs out of our phone band. If we go back to CW, we might be able to push those bums out. So let's see some proposed 40m changes, eh? Let's get phone out of there—and perhaps RTTY also.

40m used to be the truly great ham band of the world. There used to be more ham activity—and that was 100% good old honest CW, chum—than on any other ham band. It was packed solid with CW ops 50 years ago—and can be again. Ask any old-timer about it.

You know, I think 40m began to go downhill a bit when they invented the vfo. You youngsters don't know the excitement of plugging in a crystal, firing up your rig, calling a long CQ, and then tuning the entire 300 kHz of the band for a call. None of this slam-bam stuff. None of these three-by-three calls. If you wanted to get someone, you called CQ for three to five minutes. And when you were calling someone, you called them for several minutes so they could tune up the band and find you, often checking hundreds of signals as they tuned. Doesn't that sound worlds better than sending a quick CQ and checking your frequency? You bet! Do you think we could bring back crystals and junk all these confounded synthesizers we've been forced to buy?

If they took all that crap out of our rigs, they could get the price down more where it ought to be. I remember when you could buy a nice ham receiver for $29.50—the good old Hallicrafters Sky Buddy. By the time they've put in ten or fifteen bands, synthesis, sideband generators, and demodulators, is it any wonder some of these rigs cost over $500? We don't need all that stuff for CW, so let's get rid of it.

Hey, I'll be looking for you on 40m just as soon as I find where I put my key, okay? It's around here somewhere—I saw it a couple of years ago.

NEW PRODUCTS

EXL-5000 DIGITAL COMMUNICATIONS TERMINAL

Amateur-Wholesale Electronics has introduced the revolutionary EXL-5000 digital communications terminal.

The EXL-5000 features a built-in high-resolution long-persistence green monitor for sharp, clear images with no jiggle or jitter even under fluorescent lighting. Also featured are an external plug-in keyboard and a versatile built-in power supply for 117/234 V ac or 13.8 V dc. Operation is by front-panel push-button controls.

The EXL-5000 includes capability for operating in the new AMTOR modes A, B, and L. A high-speed demodulator allows Baudot and ASCII operation from 12 to 600 baud at TTL level, in increments of 0.1 baud. The demodulator will work with high or low tones. For transmitting, AFSK or FSK keying can be used. Morse sending and receiving speed is adjustable from 5 to 100 wpm in 1-wpm steps, with receive auto-tracking and variable transmitting weight.

A 1,280-character display memory is split into two pages of 40 characters by 16 lines. Seven independently-programmable 72-character channels and eight independently-programmable 24-character channels allow storage of messages for permanent use. The memories can be preloaded and reprogrammed. Errors are easily corrected. The programmable memories are backed up by an internal battery so that they are never lost.

Other features of the EXL-5000 include: full control, function display, split-screen operation, automatic send/receive switching, automatic carriage return and line feed, automatic letters-code insertion, word-mode and line-mode operation, word wraparound, simultaneous send-receive capability, selective calling, automatic timer-controlled transmission, RY and "quick-brown-fox" test signals, automatic ID, random-character generator for code practice, a printer interface, provision for an external monitor, a built-in audio monitor, a bar-graph LED tuning meter, noise-reduction receiving circuit, time clock, and much more.

Further information about the EXL-5000 may be obtained from *Amateur-Wholesale Electronics, Inc., 8817 S.W. 129th Terrace, Miami FL 33176; (305)-233-3631.* Reader Service number 479.

MODEL 510SA SMART PATCH

A new simplex autopatch will work on any amateur or commercial simplex radio and is easy to install. CES engineers have redesigned the VOX-enhancement circuitry and mobile-presence detectors in the Model 510SA Smart Patch. The improvements allow the advanced microcomputer in the Smart Patch to keep the user from missing words or information. The Smart Patch gives the mobile complete and immediate full break-in capability without losing information. The immediate control feature allows operation in the amateur service because Smart Patch cannot transmit on top of another mobile. Transmission can be terminated by an operator simply keying his transmitter. Installation consists of connecting RX audio, TX audio, PTT, and power. For more information about the Smart Patch, contact *Communications Electronics Specialties, Inc., PO Box 2930, Winter Park FL 32790; (800)-327-9956.* Reader Service number 477.

NEW HT AMPLIFIERS

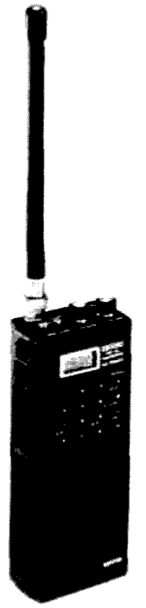
Mirage Communications has recently announced the addition of two new low-profile HT amplifiers to their expanding line of American-made communications equipment.

The B23A (144–148 MHz) and C22A (220–225 MHz) incorporate features that typically are only available on larger, more expensive amplifiers into a slim-line, low-profile package for HT use. Both amplifiers feature a built-in receive preamp that delivers a 1.5–20-dB noise figure, all-mode operation (CW, FM, or SSB), and automatic antenna changeover.

The rf power input range, from 100 mW to 5 Watts, and high rf power output (B23A, 2 W in/20 W out; C22A, 2 W in/30 W out) make them ideal for use with low-power transmitters.

The B23A and C22A are backed by a 5-year factory warranty (1 year on rf power transistors) and a worldwide sales network.

For more information, contact your nearest dealer or write to Everett L. Gracey, *Mirage Communications, PO Box 1000, Morgan Hill CA 95037; (408)-799-7363.*



The Icom IC-02AT hand-held.

IC-02A(T) HAND-HELD

Icom has announced the IC-02A and the IC-02AT two-meter hand-helds. These compact multi-featured hand-helds are the same size as the IC-2A series but have features found on no other amateur hand-held.

The IC-02A and IC-02AT are designed to be compatible with all existing IC-2A accessories plus some new accessories. An important feature of the IC-02A series is that it has 32 PL tones built into the unit as standard. These tones are programmable from the front-panel pad and may be used with any frequency at any time.

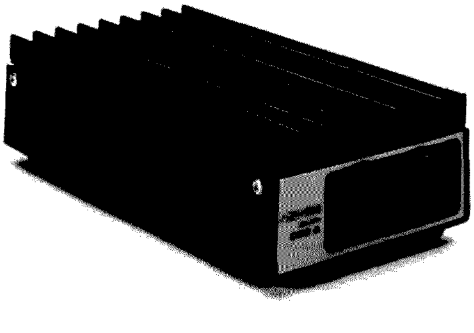
Any frequency on 5-kHz spacing in the two-meter ham band may be called up in the IC-02A. All frequency entries as well as control functions for memory, scanning, etc., are selected by the 16-button pad on the face of the radio. Included are priority watch, scanning of both memories and programmable band scan, and DTMF on the IC-02AT model. The unit features 10 memories which store frequency, PL tone, offset and offset direction, and an internal lithium battery backup. The priority channel is a unique feature to the IC-02A and IC-02AT, as well as the custom LCD readout with an S-meter function.

The IC-02A series will run at 3 Watts with the standard BP3 battery pack, or at 5 Watts with an optional high-power battery pack. A long-life battery, 8.4 volts at 800 mA, will be available to double the working time of the standard 3-Watt-output unit. Batteries may be charged a variety of ways.

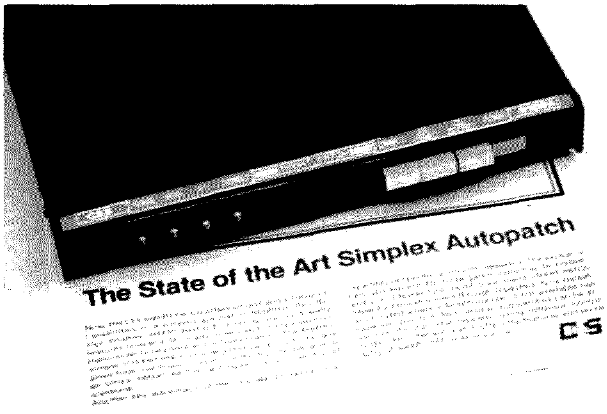
The IC-02A series has an environmentally-sealed case with O-ring seals to protect it against dirt and moisture. A heavy-duty aluminum back provides heat sinking for the 5 Watts of power.

A power connector is supplied on the top of the unit. Twelve volts applied there will power the unit as well as charge the battery pack.

For further information, contact *Icom America, Inc., 2112 116th Ave. NE, Bellevue WA 98004; (206)-454-8155.*



Low-profile HT amplifier from Mirage.



The Model 510SA Smart Patch from CES.

NEW HEADSET

Telex has introduced a lightweight headset for hand-held land-mobile transceivers. The ProCom 352-IC weighs 2.6 ounces when worn with the headband. However, when the snap-on headband is removed, the headset weighs one ounce and can be clipped directly onto eye- or sunglass frames.

When using the headset, the radio remains on the operator's belt. There is no longer any need to hand-hold the radio for communications. The headset is equipped with an in-line push-to-talk switch which also clips to a belt.

A soft ear tip channels incoming messages directly to the operator's ear so communications are essentially private. The noise-cancelling electret microphone is designed for very close talking and transmits the operator's voice clearly even in high-noise environments. The electret mike is also immune to electromagnetic or radio-frequency interference so it can be operated effectively near power lines, large transformers, generators, broadcast towers, and other equipment which so often interferes with radio communications.

The headset plugs directly into Icom or Ten-Tec hand-held transceivers. The unit is available now at local two-way radio dealers. For more information, contact Norman Hansen at *Telex Communications, Inc., 9600 Aldrich Ave. S., Minneapolis MN 55420.*

BUCCANEER SEALED ELECTRICAL CONNECTORS

A new line of English-made sealed connectors for use in hostile environments, named Buccaneer, has been announced by Radiokit, the US agent. The connectors, which are made in bulkhead, chassis, and in-line styles, are available in 2-, 3-, 6-, and 7-pin configurations as well as 50- or 75-Ohm BNC (coaxial) types for HF and VHF radio. They are waterproof, dust-

proof, rugged, and reasonably priced. The use of screw terminals or crimp connections provides ease of wiring end results in e surprisingly-small-size unit.

Originally designed for marine applications where the connecting and disconnecting of power and signal equipment is desired (i.e., search lights, generators, radios, radars, sonars, masthead antennas, etc.), these connectors can be used in most applications where reliability is essential. Other suggested uses are in dusty or damp locations and places where a connection is subject to physical abuse.

The units are made from a high-density fiberglass-filled nylon. At the cable-entry end, waterproof grommets may be changed for different cable diameters. The mating seal is achieved by a compressed O-ring. Each connector has its own captive screw-down weatherproof cap which also serves as a tool for assembly and disassembly of the connector. The 3-pin version is rated 10 A at 250 V.

For further information, contact *Radiokit, Box 411, Greenville NH 03048; (603)-878-1033.* Dealer inquiries invited. Reader Service number 476.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

I left a few items hanging last month; this month I will see if I can tidy up those few things. First off, we had looked at the problem of running a Murray-encoded teleprinter off of a computer's ASCII output.

If only it were the other way, things with a hardware solution (as we indicated would be looked at) would be a lot easier. Transforming Murray to ASCII involves a rather simple hookup (which can be accomplished with a PROM or two, a UART or two, and a few support chips), but converting the other way is quite a bit more complex. One reason for this is the problem of case-shifting in Murray. Although the ASCII machine may put out a simple string, say a callsign, as "W-A-3-A-J-R" straightaway, sending the same string in Murray involves the shift characters, sending "W-A-FIGS-3-LTRS-A-J-R." These must be inserted in the proper place with the stream of data coming downline.

Another major problem is the speed of transmission. As we discussed last month, most ASCII transmissions are running a good deal faster than Murray, and if you allow for the necessity of inserting occasional LTRS and FIGS characters, the effective data rate becomes even slower.

With this in mind, take a look at Fig. 1. This circuit was originally published here in *73* in September, 1977, in an article written by J. Gary Mills VE4CM. Although the design may resemble a work of modern art to the novice, it really is quite straightforward and one of the best of the lot that I have seen. Serial ASCII is accepted by the 1013 UART at the left, and the parallel output is decoded by a specially programmed PROM into the Murray equivalent. The data stored in the ROM includes a bit to indicate the case of the character, and tests are performed on the data stream to insert the proper case shift where indicated.

A clock circuit, shown in Fig. 2, is used to drive the Murray output at any popular speed from 60 wpm to 100 wpm (45.45 baud to 75 baud). The speed of the ASCII portion of the circuit is fixed at 110 baud, commonly called 100 wpm. Please don't confuse 100 wpm Murray (75 baud) with 100 wpm ASCII (110 baud). It has to do with the greater number of data bits (11 in ASCII, 7.46 in Murray) and the need to send them faster to get the same number of characters out. If you still don't follow, reread last month's column, calculator in hand.

In order to interface this circuit with a teleprinter, the scheme presented in Fig. 3 may be useful. This will serve to connect this, or any other TTL-level output, to drive a Model 33 or Model 35 Teletype® machine. I think it may come in handy for many an application.

What about that PROM, you say? Well, the author of the original article presented an abbreviated coding table for the code conversion. Presented here as Fig. 4, it is, I agree, a bit sketchy. You can get the idea, however, and the complete diagram may still be available from the author of the article or VE4 Logic, 76 St. Clair Blvd., Winnipeg, Manitoba, Canada R2C 0V2.

The second line I left dangling was a new RTTY program written by Clay Abrams K6AEP. Well, Clay has done it again! NEWRTYCW is a program written for a TRS-80C Color Computer with 16K or more memory which does not require Extended Basic or a disk to run (more on that last point later). It enables the CoCo to send and receive Murray RTTY, ASCII RTTY, and Morse CW at essentially any speed.

This machine-language program is supplied on a cassette tape which CLOADMs and executes automatically. This makes it impossible to load and look at or duplicate with the SAVEM command. After booting, the program asks for your callsign or other ID, up to 31 characters which can be sent at a keystroke.

The program itself is rather striking in all its abilities. There are four small "station" buffers, 254-byte buffers which are useful for storing three or four lines of text. Also available is a keyboard buffer,

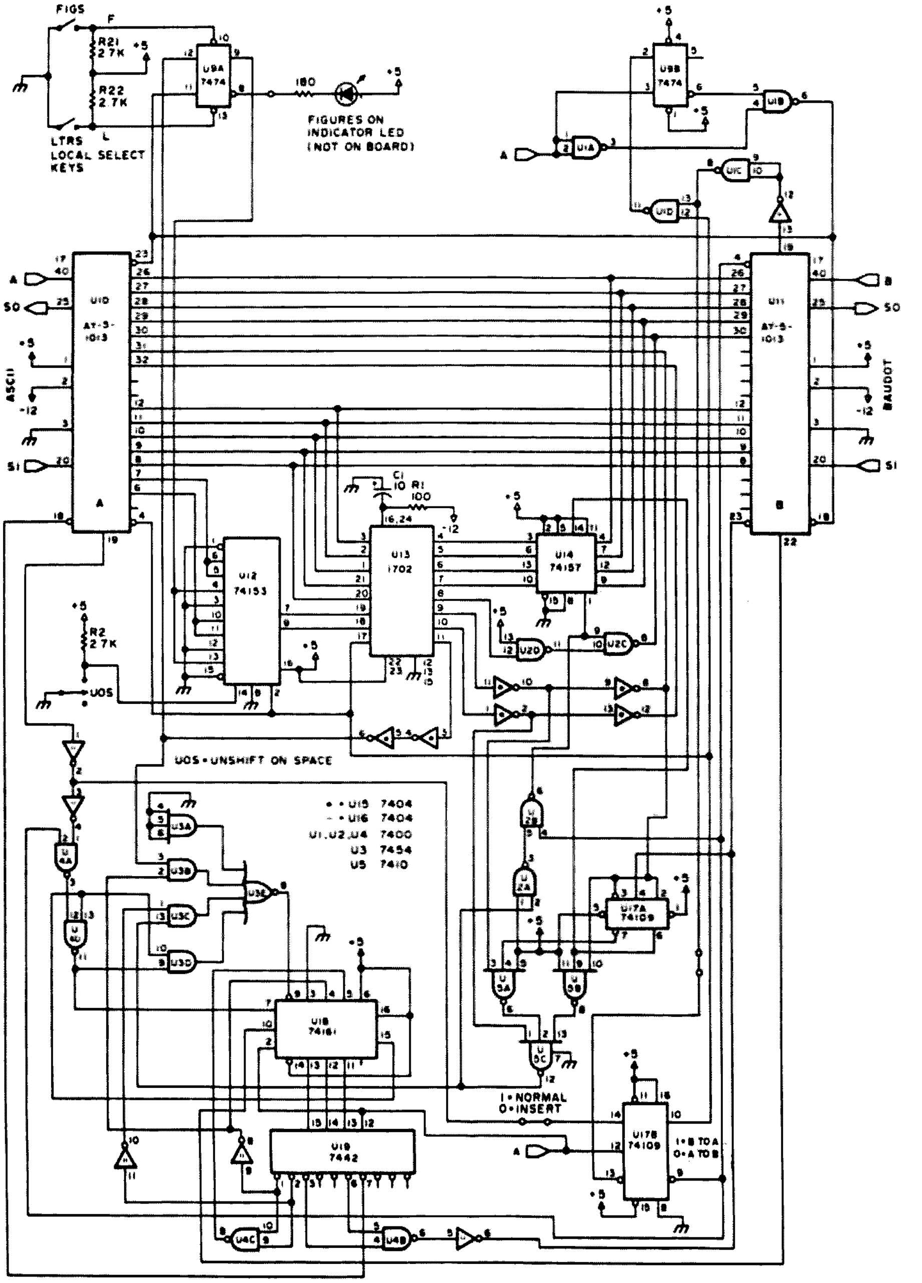


Fig. 1. ASCII-to-Murray converter.

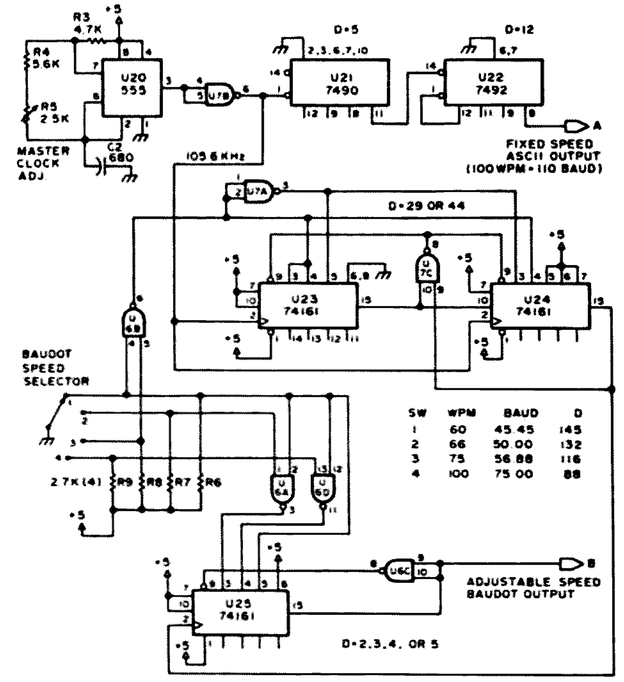


Fig. 2. Clock driver circuit.

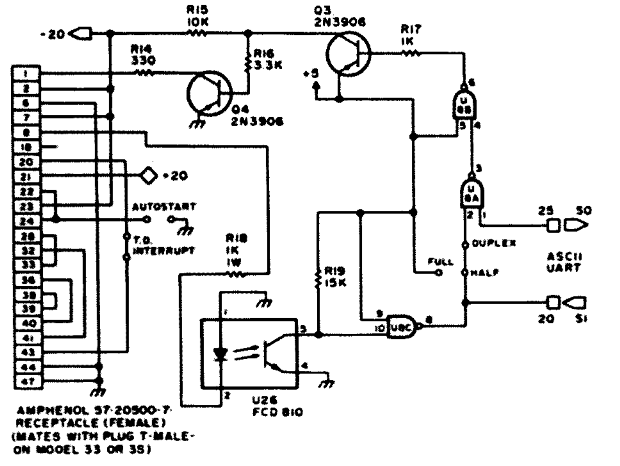


Fig. 3. Teleprinter interface.

12K in size on a 32K machine, and a receive buffer of equal size. These buffers may be loaded from tape, saved to tape, or printed out on the system printer. There is also a raft of features. Let's look at a few of them.

On RTTY, an automatic CR/LF pair may be generated, if desired, after the character in the tenth through eightieth column. At which position to limit, if at all, is easily specified. Station buffers, keyboard buffer, or even the receive buffer may be transmitted with a keystroke. Unshift on space is supported and may be turned off if desired. The number of carriage returns sent may be changed from the default of one up to nine. This is useful on some circuits, such as MARS, where I well remember the required CR-CR-LF-LTS-LTS sequence. There is even an automatic RY generator!

When operating CW, the functions are essentially the same as with RTTY, with a few exceptions. The speed of the incoming station is tracked, with transmit speed being set ahead of time. All the buffers work the same, as do the features, except that the RY test does not send Morse Vs. However, there is a code-practice option which sends random five-character groups with the audio heard over the TV set speaker. By the way, the CW portion provides several keys for "specialized" signals: the @ key is the BT (— . . . —), $ is the AR (. — . — .), the * is the AS (. — . . .), and several others.

Now, there are a few problems with this program. Sorry, Clay, but I do have my opinion! First of all, this is a self-booting tape. While I have no need to copy it, I would like to transfer it to disk, at least to load it. That cannot be done, as it assumes control of the machine as soon as it loads.

Secondly, saves and loads can only, currently, be made with tape. Clay does indicate, however, that a disk version is in the works.

And finally, if you have the CW transmit speed set, say, at 15 wpm and tune in a station sending at five, your response will stay at the faster speed unless you break out of the receive routine and reset the speed. Kind of messy. Two possible solutions would be to have the sending speed approximate the receiving speed (optionally, of course) or to have a control function reset the speed while still receiving.

One more thing—the keyboard input seems a little sluggish on my CoCo2. When Tandy upgraded the Basic ROMs, they moved the routine that polls the keyboard for input by a few bytes. If this program is using the old address, that would explain the sluggishness. I can't check it because of the "locked" nature of the program.

The solution is to use extended indirect addressing instead of plain extended addressing. It only takes one byte of data, but it would mean reassembling the whole program. Oh well, something more to think about!

All in all, this program looks hard to beat. Clay says that he is selling them like hotcakes. I am sure he would like to hear from you. Drop him a note care of Clay Abrams Software, 1758 Comstock Lane, San Jose CA 95124, and tell him WA3AJR sent you!

Now, a lot of you have been writing me notes and asking for a repeat of some of the basics. I don't think that reruns here are in order, but I will agree that there are many newcomers out there who might benefit from a review of material printed here several years ago. Therefore, I cautiously announce a new service. I shall try to put together on a monthly basis a compendium of RTTY material to be available by mail from the above address. The first edition will be an elementary introduction to RTTY, with other topics to follow in future months. Such items as RTTY reception, transmission, and machines are some of the items I hope to review. I shall announce each edition here as it becomes available.

To receive your copy, just send $2.00 and a self-addressed, stamped envelope (or sufficient US funds for foreign postage) to me at the above address. I hope this answers the needs expressed in so many of your letters. Watch this column for announcements of future editions.

Next month begins our eighth year of RTTY Loops. It is sure to be exciting, so be sure your subscription to *73* is current and watch for each month's RTTY Loop.

Address		Data			
Hex	Binary	Hex	Binary	Character	Purpose
00	00000000	40	01000000	NUL	
01	00000001	FF	11111111		ASCII to Baudot
...					
1B	00011011	5B	01011011	ESC	Cntl and Figs.
...					
30	00110000	36	00110110	0	
31	00110001	37	00110111	1	
3F	00111111	39	00111001	?	
40	01000000	FF	11111111		
41	01000001	03	00000011	A	ASCII to Baudot
42	01000010	19	00011001	B	
...					Letters
61	01100001	03	00000011	a	
62	01100010	19	00011001	b	
...					
7F	01111111	5F	01011111	RO	
80	10000000	00	00000000	BLNK	
81	10000001	45	01000101	E	Baudot to ASCII
...					
9B	10011011	82	10000010	FIGS	Unshifted
9C	10011100	4D	01001101	M	
9D	10011101	58	01011000	X	
9E	10011110	56	01010110	V	
9F	10011111	7F	01111111	LTRS	
A0	10100000	80	10000000	BLNK	
A1	10100001	B3	10110011	3	Baudot to ASCII
...					
BE	10111110	BB	10111011	;	Shifted
BF	10111111	7F	01111111	LTRS	
C0	11000000	80	10000000	BLNK	
...					Auto unshift
DF	11011111	7F	01111111	LTRS	on space
E0	11100000	FF	11111111		
...					Unused
FF	11111111	FF	11111111		

Fig. 4. Abbreviated PROM coding list.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

THE WONDROUS WWV—PART 2

Have you been listening to WWV at 18 minutes after the hour as I suggested last month? If not, turn on your receiver, tune in WWV at 10000.000 kHz, and listen as you read this.

In addition to its main function of providing a time and frequency standard, WWV also disseminates information for other government agencies. Included are storm warnings at 8–10 minutes after the hour and Omega navigation information at 16 minutes after (the Omega system is a VLF location system—10–14 kHz). The information of greatest interest to amateur-radio operators, especially DXers, is the Geoalart bulletins, at 18 minutes after each hour.

The information in these bulletins is produced by the National Oceanic and Atmospheric Administration (NOAA), which shares space in the same building as the National Bureau of Standards' master cesium-beam clock (see this column, last month.)

Every three hours an officer at the NOAA Space Environment Services Center in Boulder picks up a phone and calls a special drum recorder in the master clock room at the WWV transmitter site, 35 miles to the north in Fort Collins, Colorado. That drum is controlled in the same way as the drum which has the voice time announcements. When the 18th minute rolls around, the recording is broadcast on WWV. (You can also listen to the message by calling (303)-499-8129.)

The form of the message doesn't vary. First comes the solar-flux level from Ottawa, Canada. This is followed by the A index, the K index, and information on solar activity and geomagnetic storms. DXers can compile this information and use it to increase their DX efficiency, especially in times of low sunspots, such as now. Let's look at this information and see how it relates to DXing.

The Solar Flux

The first item covered in the Geoalert bulletin is the solar flux. This is the amount of radiation coming from the sun at 2800 MHz, as measured in Ottawa. (Ottawa figures are used because they have been recorded since 1947 and they provide a consistent picture of the sun.) This solar-flux figure is directly related to the number of sunspots on the surface of the sun facing the Earth. It is easier and more consistent to measure the solar flux than to go through the somewhat arbitrary calculations of sunspot numbers. And solar flux can be measured when it's cloudy!

The solar-flux index ranges from 66 to about 250 or even higher. A reading of 68 is equivalent to zero sunspots—zilch! At about 80, there is enough radiation coming from the sun to open the 15- and 10-meter bands to some parts of the world. Higher readings suggest a better ionosphere, from the ham-radio point of view. What is most important about the solar flux, however, is the *trend* of the figures. A rising flux suggests improving band conditions; falling figures indicate the bands are deteriorating.

Also, the flux figures provide some predictive value for the next month. Since the solar flux is tied directly to sunspot activity and because the spots swing around as the sun rotates about once every 27 days, you can make some guesses about radio conditions 27 days ahead, based on today's figures. Alas, the sun is more fickle than this suggests. Even the largest spots have been known to completely disappear as they go around the back of the sun. And new spots spring up without warning. Still, the value of the flux 27 days ago is one of our best predictors of band conditions. Just don't bet your life on it.

Another useful predictor based on the solar flux is a sudden increase in its value. The extra radiation suggests that more particles will be streaming from the sun, and it's these ions, electrons, etc., which stir up the ionosphere and give us good DXing. These particles move at speeds less than that of light, so they arrive a day or two after the flux values change. So a sudden increase in solar flux suggests better band conditions in the next day or so.

To make the best use of the flux figures, you should write them in your log daily. Then compare radio propagation at *your QTH*, with *your* equipment, to the flux values. With time, you will begin to see how that solar flux correlates to DXing from your station. DX clubs often have a member who keeps track of the flux values on a daily basis and shares the data over a repeater. And some of the DX bulletins publish this information. But entering this figure daily in your own log is still the best way to track band openings. Try to get the figure soon after the 1800Z daily update.

The Other Figures

While solar-flux level is a good predictor of future band conditions, the A and K indices provide a better idea of what is happening *now* on the bands. The A index is a figure between 0 and about 100 (although readings as high as 400 have been recorded). It is a measure of the geomagnetic activity of the Earth's magnetic field. When the A index is low, not much is happening, and signals pass with little attenuation or loss. An index reading of 10 or less suggests "quiet" conditions, just what the DXer ordered. As the sun starts acting up, however, the A index will rise, the Earth's magnetic field starts jumping around, and absorption increases. Your signals get weaker. At high absorption levels, you might as well turn off the radio and go mow the lawn or get reacquainted with your family.

Unfortunately, the A index is yesterday's news. Even though it is updated every three hours, it reflects what went on in the ionosphere yesterday. So when you hear a high value on the A index, you know that the bands stunk yesterday, something you were probably already aware of. This is similar to getting weather "forecasts" for the previous day.

So why pay any attention to the A index? First, the *trend* of the index is important. If the absorption level is rising, the bands will be getting worse. If it's falling, maybe you should anticipate spending more time on the air. Also, as with solar flux, the A index tends to repeat at 27-day intervals, as the sun rotates. A bad day (high A value) 27 days ago suggests today will be punko, too. Of course, the vagaries of the sun and a little Murphy keep this from becoming as simple as it seems.

The A index is especially meaningful as related to polar radio propagation and high-latitude east-west paths. The north-south paths are little affected even on days of high A readings. So consider swinging the beam to the south on days of high absorption.

The last figure given in the 18-minutes-after-the-hour Geoalerts is the K index. This is similar to the A index, except that it is much more current. It is actually measured right at the Boulder, Colorado, labs and updated every three hours like the A index. The K index varies from 0 to 5, with the higher numbers reflecting higher absorption, just as with the A index. A K reading of 4 or 5 suggests lawn mowing. A low K of 0 or 1 means it might be well worth tuning around the bands.

Again, the *trend* of the index is as important as the actual value. If the K index is higher than it was three hours ago, things are getting worse. Tell your spouse you'll go out to dinner after all. Decreasing K readings mean the absorption is lessening.

To recap these numbers, DXers pray for high solar flux and low A and K readings. A solar flux of 200, A=3, and K=0 would be a banner day to DXers. A flux of 85, A=34, and K=4 encourages even the most avid DXer to consider stamp collecting.

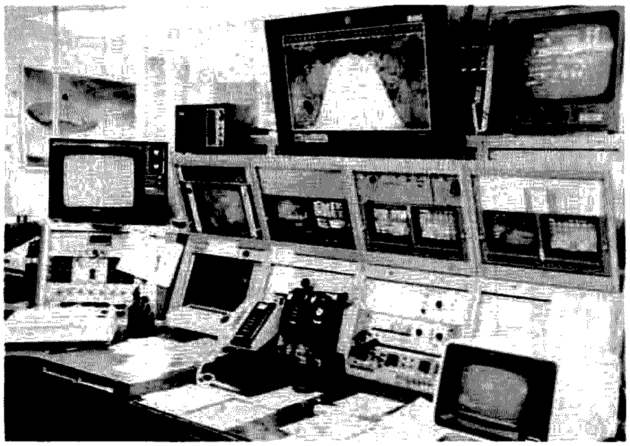


Photo A. The control room at the Space Environment Services Center in Boulder, Colorado. Information on the state of the sun and the Earth's magnetic field pours into this communications hub and is distilled into the WWV bulletins at 18 minutes after the hour.

Storm Warnings

The last item on the Geoalerts is a description of solar activity, especially any solar flares. Flares are sudden eruptions on the surface of the sun which fling out enormous numbers of charged particles into space. Flares occur very suddenly, lasting a few minutes to a few hours.

Flares can be real disasters for DXers. The swarms of particles and ions rip up our ionosphere, sending absorption sky high (if you'll pardon the pun). A major flare can produce a Sudden Ionospheric Disturbance (SID). Most hams have experienced one or more of these: You turn on your rig and you hear nothing, absolutely nothing—not on any band. I once spent two hours ripping apart my station and tearing into my receiver, certain that something was seriously wrong. Of course, something *was* wrong, but with the ionosphere, not my station. It was several hours before the bands began slowly to return to normal.

There is nothing you can do about the SIDs. When one hits, turn off the radio and walk away. Unfortunately, we'll be seeing a lot more of these DX disasters in the next few years. With declining sunspot activity, SIDs tend to become more common. Also, there seems to be a vague 22-year cycle associated with SIDs, and the 1984–1985 range is 22 years after some of the most severe SIDs ever recorded.

Fortunately, WWV will give you some advance warning about SIDs. The Space Environment Services Center (SESC) monitors the X-ray output of the sun constantly. Information on the X-ray level pours into the Boulder labs from stations all over the globe and from two satellites above the Earth, GOES 5 and 6. This information reflects activity on the sun as currently as possible, with only an 8-minute delay for the speed of light.

The information on the X-ray flux is automatically charted on a video monitor (see Photo C) as one part of the SESC control desk (see Photo A). The office is manned 24 hours a day, with staff such as Master Sergeant Harry Sorg (see Photo B) keeping a close eye on any sudden changes in the value. The close-up photo of the video screen shows a Class M flare, serious enough to disrupt communications. A Class X flare wipes out everything, and a very powerful Class X flare can knock out power lines and do other physical damage. High-flying airliners on polar routes might be exposed to excessive radiation during flares. And persons living in high-latitude regions will be treated to a glorious aurora, which they might as well watch, since all radio propagation will be nonexistent!

But thanks to the time lag between when the flare starts (as indicated by the sudden burst of X-rays) and the time the particles which do the damage arrive (a day or so later), SESC can issue warnings to help reduce damage. And vital communications lines can be prepared for the coming radio blackout. When a major flare starts, Sergeant Sorg and his counterparts start notifying a list of customers that the particles are on the way. And they also put the information into the geophysical alerts at the end of the 18-minutes-after-the-hour WWV bulletins.

The SESC tries to predict flare activity based on complex models and studies of the sun. The magnetic fields around the sunspots, the relative motion of the spots, the flare history of a spot group, and other information is compiled and analyzed at the SESC office to generate this forecast of flare activity.

So when you hear the words "Solar ac-

Photo B. Master Sergeant Harry Sorg points to the solar flare recorded on the video screen. X-ray data from ground stations and satellites reveals the current state of solar activity.

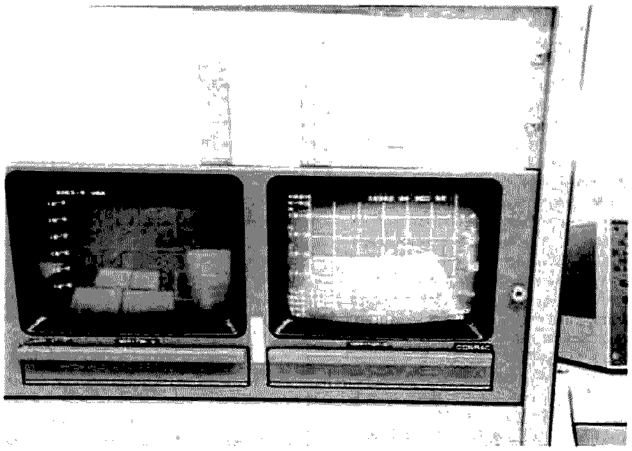


Photo C. Close-up of the X-ray monitor screen showing a Class M solar flare at about 1545Z. In a day or two, radio propagation will be affected by the charged particles from this flare.

tivity expected to be high" on the WWV bulletin, be prepared for some fireworks. On the other hand, the influx of solar radiation which arrives at the speed of light tends to increase the ionization of the atmosphere and *improve* radio propagation for a few hours. So a solar flare is a mixed blessing for DXers. The first few hours will be good radio operating times. In fact, some of the best possible propagation occurs just after the onset of a flare. But then the next day or so when the particles arrive: wipeout!

All of this information is packed into a few words, sandwiched between the tones, ticks, and beeps of the regular WWV information. And I haven't even mentioned some of the other data available from the WWV broadcasts, such as musical tones, standard audio frequencies, information on how fast the Earth is turning (listen for the ticks after the start of each minute!), and more.

The National Bureau of Standards and WWV provide a unique and useful service to amateur-radio operators and others throughout the world at remarkably low cost to the taxpayer. Keep them in mind the next time someone starts talking about government waste and inefficiency. And I would like to especially thank those NBS staffers and others who made my visit to the wondrous WWV and the Department of Commerce Boulder labs so informative and enjoyable: John Milton, Chief Engineer of WWV, Howard Machlan, WWV Engineer, Master Sergeant Harry Sorg, SESC staff, and especially Fred McGehan, Public Information Officer for the NBS.

That's it for this month. Next month we'll get down to some nitty-gritty about propagation and how you can use all of this information to improve your DX success. Meanwhile, listen to WWV at 18 minutes after the hour, tune into 14100, and log what you hear on that frequency. You'll be surprised at what you hear! I'll cover more on the Northern California DX Foundation beacon network in a future column. Good DX!

REVIEW

N2NY HAM MASTERTAPES

Well, I knew it would finally happen. These days just about anything you can imagine is showing up on videocassette. Movies, Broadway shows, hard-core porn, musicals, and training/instruction on just about everything from A as in apple growing to Z as in the training of zebras. It's all there for you to enjoy if you happen to own a home videocassette recorder and are willing to pay the price for the software.

Inevitably, the time would come when some enterprising ham would think in terms of training prospective amateurs using this developing media. Last spring, while visiting the east coast during the pre-production planning for "Amateur Radio's Newest Frontier," I was invited by Larry Horne N2NY to be a guest on his cable-TV program. It was then I learned that Larry had spent the better part of the past 24 months planning the production of an all-inclusive videotaped amateur-radio training program.

Training newcomers is nothing new to N2NY. He's been teaching amateur radio literally from the day he was first licensed, 32 years ago. His first graduates were his fellow grade-school students, and N2NY has been going strong ever since. His dream has always been that of making entry into the ranks of the US Amateur Service available to anyone who has the interest.

The release of the Ham MasterTapes training course by N2NY did pose one problem for publications such as this. Simply, neither *73* nor any other amateur-radio periodical had been put in the position of having to review a videotape. *73* was a bit luckier than the rest. They knew that one of their Associate Editors makes his living by "making television," and that's how it came to pass that this writer finds himself producing a review on the N2NY Ham MasterTapes.

The main question is whether or not the N2NY Ham MasterTapes are worth the $200 price tag. From my standpoint, the answer is in the affirmative, but in the end only you can make that judgment. Dollarwise, they are an excellent investment for anyone planning to teach an amateur-radio school of any sort because they take away the need of having to solicit specialized equipment usually required for live demonstrations. It also does away with those embarrassing moments when a demonstration either fails or backfires in a way that nobody is expecting. A VHS or Beta home VCR and a color TV set replace the collection of gear that is usually necessary for such classes, and the demonstrations work perfectly every time.

I'm convinced that in his younger days, Larry was as addicted as I was to the NBC children's science program, "Watch Mr. Wizard." In his Ham MasterTapes, N2NY has utilized and expanded upon the teletraining methods developed—and still used by—television's teaching master, Don Herbert, the real Mr. Wizard. Those of you who were around during Mr. Wizard's tenure on NBC will remember that each week Don would spend 30 minutes every Saturday afternoon teaching one of the local kids what he called "the magic of science in everyday living." True, the local kid was a professional actor or actress, but the idea was that of educating by making learning fun. That's exactly the method utilized by Larry Horne in Ham MasterTapes.

Larry appears as much at home before a TV camera as he would be if you met him on the street. The fact is that this is actually the case. After several years of producing and hosting a weekly program, he has developed a very laid-back style of his own. This style, along with his obvious dedication to what he is doing, ranks him quite high on the list of educational television instructors. His on-camera presence helps counter the somewhat plastic performances of the others, which is about the only flaw in the entire production.

There are two methods of producing any film or videotape. One is Rehearse - Run-Thru - Rehearse/Tape - Air/Tape; the other is Block and Shoot. Larry's decision was to use the latter, and it appears to have been a wise move. It meant that an entire script did not need necessarily to be memorized at one time, and it permitted the use of prompting devices as well.

By using Block and Shoot, attention could be given to each individual aspect of the overall presentation, permitting attention to be paid to minute detail, simple things, such as the way an array of handheld radios was placed on the table before the trio so that they were clearly visible on camera. Without several additional people to keep exact notes, it is all but impossible to use the earlier method without matching shots using an additional VCR playback for the purpose. By going to Block and Shoot, each scene could be done individually as many times as needed until Larry, as producer, was satisfied. The actual taping took five 10-hour work days. Again, by way of comparison, your TV sitcom usually takes only 4 hours total to tape, but at least 7 days...sometimes 20-hour days of preparation and rehearsal.

These days, it appears that a TV program is made or broken in post-production. That's another word for editing, and it's become an exacting science. Under Larry's personal supervision, the program was edited by his director, Christopher Stola, and the post-production phase is one of the high points. I say this based upon the minimal use of far-out special effects that might tend to confuse the viewer. Larry and Chris used the KISS Principle (keep it simple, stupid) with scene-to-scene transitions being the traditional "fade," and all transitions in a given segment being either straight cuts or cut-to-freeze-frame when a point needed emphasis.

In one place, Larry did get a bit liberal with his use of the freeze-frame, but it was something truly spectacular. Ever discharge a capacitor and notice a spark? Moves by pretty fast, doesn't it? Not in the Ham MasterTapes. Using stop-motion freeze, the viewer is treated to a spectacular fireworks-like display as the capacitor is discharged in a fiery fury. Almost something akin to the effects in "Star Wars," but not planned to be that way.

Every important point covered is emphasized by on-screen "fonts," i.e., texts superimposed on the screen, such as the name of a reporter on a news program. Larry uses fonts liberally as a way of permitting the viewer to take simple notes during the segments and review each subject after each of the 26 segments has been completed.

Just about everything you can think of (and some items you may not expect) are contained in the N2NY Ham MasterTapes. Larry does not stop at giving the minimum amount of information needed to pass an amateur examination. This is where most training courses end, leaving the student hung out to dry with a license and radio, but no experience with either. The traditions of amateur radio are rarely, if ever, included in programmed training courses. The so-called cheat books give only questions and answers. Most courses simply teach the minimum necessary to pass a

test. The N2NY Ham MasterTapes pick up where everyone else leaves off.

Larry has told this author quite candidly that learning how to operate various modes and rigs is important, but so are proper on-the-air procedures. There are also the traditions of the Amateur Radio Service, and they are included in the study course—things like the best way to conduct oneself on the air, entering a QSO, and operating a repeater. Even the way in which repeaters are coordinated to their channels by voluntary coordination councils is explained, and in detail. To put it concisely, everything other than CW is included in the N2NY Ham MasterTapes training program, and that puts it head and shoulders above just about anything else on the market.

As you sit and watch the Ham MasterTapes series, one thing comes across. The people who put them together really cared about what they were doing. Quality of production was obviously paramount to Larry and his crew, with cost of production taking a back seat. There would be very little I would change if it had been my show, except perhaps to use professional actors in place of volunteer students. While this may seem to be a contradiction in terms, as any good producer or director will tell you, the people who handle themselves best and appear natural on camera are those who have been specifically trained for that task. Each of us does one job best, and when actors are called for, I believe in using them. There's no substitute for experience.

I won't tell you the best way in which to use them, but whether you purchase the tapes for your personal use or to augment a training class run by your club, they are definitely a worthwhile investment. They have the ability to stand alone or be incorporated into a structured training program—and that's another part of their beauty. Any time a technical subject is broached and where needed demonstrations are included, Larry takes the time to stop and explain what he means in simple, easy-to-understand layman's terms. One thing is sure: Your students won't get bored.

The tapes are available on VHS and Beta formats at standard play speeds (Beta II and VHS-SP) so as to be compatible with just about any home VCR. Duplicating quality is what one would expect, being several tape generations down from the original masters, but they're on a par with most movie rental tapes. I would strongly recommend using multiple 25" TV sets for showing to large groups. Avoid video projectors, as all home-video systems appear to become fairly grainy when used in conjunction with them. For at-home viewing, any 13" to 25" TV set will suffice.

At $199.95, the set of tapes is not cheap, but it is definitely a good investment if you are among those working toward strengthening the US Amateur Service by bringing new amateurs to it.

For more information, write *Larry Horne N2NY, Ham MasterTapes, 295 Park Ave. South, New York NY 10010.* Reader Service number 478.

Bill Pasternak WA6ITF
73 Associate Editor
Saugus CA

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

LETTERS

FATHER MORAN ARRIVES

I need your help in publishing the fact that Father Moran 9N1MM is coming to the US, arriving September 4. This will be his 60th year as a Jesuit missionary.

I am in charge of scheduling his trip all over the US and I am looking for DX clubs in the larger cities who would like to have him for a guest for 2 or 3 days.

Send all inquiries and donations to me.

Edward F. Konop W3WGS
125 Wetzel Rd.
Pittsburgh PA 15209

EGO MISSPELLED

I just read your "Ego" editorial in the February issue of *73* and noted the spelling error: It's spelled E-N-E-R-G-Y. Your subscription-chucking critics are jealous of the energy that jumps off the page at me.

I am at the moment earning radio money as I write. I am a part-time security guard at the dead heart of what was once a huge restaurant empire. It's all being sold off, from semitrailer trucks down to Sanka—desks, pencils, meat massagers, all lying in heaps on the once-busy warehouse floor. It's like visiting the home of a recent widow, before she's cleared out all the guy's stuff. What happened? Shortsightedness, greed, and *lazy thinking*!

One hears of bankruptcies by the score (9 out of 10 new businesses quickly fail, I hear), and people wonder why anyone would even try to start a new business. Or a magazine. As I learned from a bunch of soap salesmen, though, anything is possible—as long as you get off your butt and go after it, rather than sit in front of a TV and wait for somebody to throw success in your lap. I'd like to thank you for saying the same basic thing. You are helping me keep a new leaf turned, to have goals instead of wishes.

Included in my rounds through the moribund imperial seat of Sambo's is their print shop full of Heidelberg presses, paper, a darkroom, etc. I started a college newspaper with some other oddballs and ran it for the two years I was there, so the smells of ink, developer, paper, and wax conjure forth some powerful memories. As I remember what fun the whole process is, from writing and paste-up to printing and feedback, I realize that both you and your niche are lucky to have found each other. Keep having fun. I am with you all in spirit.

Anyhow, I enjoyed your magazine and editorial and thought I'd write and feed your ego. Drat. Now *I* misspelled it.

Lyle D. Gunderson
Santa Barbara CA

BITTERSWEET VICTORY

I read with great interest the March issue of 73. The diaries of those trying to contact STS-9-W5LFL were very exciting to read, even though few were successful.

Unlike some other ham magazines, *73* prints real-people experiences and brings us right into their ham shacks.

I didn't think to write about my W5LFL "contact" but it may be of some interest. At 13:07Z on December 6 (orbit 128) I used an Azden PCS-2000 borrowed from my neighbor next door, Charlie Newman KA4TRF, a 2-meter home-brew quad (K4HDV), and my Curtis KB4900 keyboard, set for 18 wpm. I sent, "W5LFL de W8SJO AR K," to which (during my repeating several times) Charlie came running in the front door (13:06Z) yelling, "You did it! Stop transmitting! He answered you—he said, 'W8SJO, this is W5LFL in the spacecraft, *Columbia*, acknowledging your CW call.'" And then Charlie said he faded away.

I am feeling it was a rather bittersweet victory. Not only because I personally didn't hear it, but also because my "contact" (yet to be confirmed—on this pass in this area—west central Florida—he wasn't heard answering anyone else) resulted in suspicion, denial, accusation of fabrication, disbelief, and alienation of some former hams who I thought were friends.

After the Sarasota newspaper (*Herald Tribune*, January 4, 1984) printed my story, one particular "friend" was in a state of rage. To this day he hasn't spoken. I feel sorry that a facet of ham radio has become a source of envy, jealousy, and animosity, instead of a comradery which comes from mutual respect and admiration of each of our own personal accomplishments.

Most of the hams are very supportive and congenial to me still. Most feel as I do...it really is no big deal...they know the facts. But I wanted to write this to perhaps bring up a point that I doubt has been really considered.

Personally, I'm bedfast most of the time, on oxygen, and ham radio (especially high-speed CW) is really a great hobby for me. I don't understand how we could have become so competitive in our avocation that the human element of fraternal socialization is being lost.

Barry G. Yoder W8SJG
Bradenton FL 33529

BIASED STORY

Your extensive coverage of the W5LFL DXpedition in space leaves me feeling that hams are trying to tell only the good part of the story. Oh, there were a few mentions of transmissions on the downlink. And Wayne Green passed off the negative aspects of the operation with three sentences, ending with, "the usual crapola."

I do not wish to take away from the significance of this historic moment for our hobby, but I came away with a different perspective.

Never in my experience has any event been so well publicized. The frequencies were published far in advance in magazine after magazine. In our area, 2-meter repeater nets went over the game plan in agonizing detail. Goddard and Houston were on HF with complete and updated information. And much more!

Yet, in the Dallas Metroplex area, you would think the whole thing came about on the spur of the moment. One of the really good passes by W5LFL was clobbered in part by "turkeys" on the downlink and "policemen" yelling at the turkeys. I understand it was worse in many other areas. The whole time Owen was in space, the conduct of hams in this area proved that maybe we need an intelligence test for hams, rather than a code or theory test.

Hams had better quit yapping about what a great asset we will be in a "real emergency." If we as a group cannot handle a simple air-to-ground commo exercise, with everything laid out for months in advance, what will we do if that "real emergency" comes up?

I am ashamed to play my tapes of Owen's transmissions to anyone outside the hobby. In a way, we are managing news, by telling only part of the story. We get real upset with the White House or CBS or *The New York Times* if they do that.

Richard C. Rhodes KH6IO
Dallas TX

OVERKILL

A ham operating from space is certainly a great event in the history of amateur radio and worthy of an article or two in any amateur-radio publication. The 22 stories taking up 32 pages in the March *73* seems a complete overkill. 22 consecutive articles on how to install PL-259 connectors would be just as interesting and informative.

Bruce A. Wilke KB0UV
Wapello IA

ECLIPSE NET

A unique opportunity to aid the scientific community will occur on May 30 for hams in the southeastern and mid-Atlantic states. On that date the moon will pass between the sun and Earth, causing a solar eclipse visible across portions of eight states: Alabama, Georgia, Louisiana, Maryland, Mississippi, North Carolina, South Carolina, and Virginia.

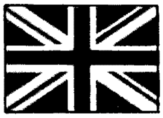
Amateur-radio operators in these areas are needed to relay current weather information and predictions for two days prior to the event and to conduct propagation experiments during and after the eclipse. Persons interested in helping out should contact me.

Joseph Rao
Compu-Weather, Inc.
PO Box 1122
Lindon Hill NY 11264

73 INTERNATIONAL

from page 78

major language spoken, but did you know that besides Spanish over 100 dialects also are spoken? Almost all of them have nothing to do with the Spanish language and have been spoken for thousands of years. You may just get a chance to hear one spoken on two meters sometime when you're down our way! *Hasta la vista* for now!



MONTSERRAT

Errol "Bobbie" Martin VP2MO
PO Box 113
Plymouth
Montserrat
British West Indies

STAR-GAZING TOWARD MARS

The Montserrat Amateur Radio Society (MARS) was founded in 1978 by a small handful of amateurs here on the British Caribbean island of Montserrat, West Indies. It all started when the amateurs decided to pool their efforts in publicizing amateur-radio activities here. The first meeting took place at Foxes Bay at the home of Arnold VP2MH and his beautiful wife Arleen VP2MI. Gathered there were: Arnold Gauthier VP2MH, Charles "Chod" Harris VP2ML, Dr. Konrad Hollatz VP2MF, and Errol "Bobbie" Martin VP2MO.

The first order of business was to elect officers, and this took only a few moments, for the decisions were unanimous. The results were: President—Chod VP2ML, Vice-President—Bobbie VP2MO, Secretary/Treasurer—Arnold VP2MH, and Executive Member—Doc VP2MF.

The total membership immediately rose to 8 when the XYLs decided that they were not going to be left out: Arleen Gauthier VP2MI, Ilse Hollatz VP2MD, Mae Martin VP2MN, and Jean Harris who was not then a licensed ham. Thus began the Montserrat Amateur Radio Society.

Looking at the Society as it is today, it's somewhat difficult for the unknowing to imagine the humble beginnings it had. The first project was introducing amateur-radio classes locally and exposing the general public to amateur radio. This was done in the form of demonstrations, newspaper articles, etc. We immediately applied for and were granted affiliation with the IARU and the ARRL, and Montserrat really came alive on the bands with our operators making world-class scores in the contests and in the pileups.

As we know it today, MARS, with its special callsign, VP2M, is still very active and instrumental in promoting amateur radio nationally and internationally. It is proud of its membership of about 50, divided into three categories: full membership, which entitles one to vote and be eligible to hold office, associate membership A, which entitles the holder to vote but not to hold office, and associate membership B, which is for anyone not a licensed operator but who has an interest in amateur radio, for which there is no age limit.

The Society still has among its priorities amateur-radio training programs, at the end of which there is an exam based upon knowledge of the theoretical aspects of electronics and amateur radio and the capability to receive and send 12 words per minute in Morse code. Through this system there have been a number of new hams on the air.

The present officers of the Society are: Dr. Vernon Buffonge VP2MV, President, a former student of the Society, Sydney St. C. Meade VP2MC, Vice-President, Ursula Sadler VP2MDY, Secretary/Treasurer, also a past student, Victor James VP2MQ, Equipment Officer, also a past student. Executive Members are Dr. Konrad Hollatz VP2MF, Errol "Bobbie" Martin VP2MO, and Perry Britain VP2MR.

The Society's equipment (for its club station) includes an Icom 730, an IC-22, antennas for 2, 10, 15, 20, 40, and 80 meters, a Spectrum SCR-1000 repeater, and a Phelps-Dodge 22' vertical antenna. The repeater is housed in the receiving-station building of the Antilles Radio Corporation, under their auspices, and the antenna is mounted on a 36' pole donated and installed by our local power company, MONLEC. All this is located atop St. George's Hill which rises 1100 feet above sea level overlooking Plymouth and is readily accessible by hams on the neighboring islands.

The repeater and associated equipment were obtained through the perseverance of a few local hams assisted by the influence and integrity of our governor, Sir David Dale, as a gift from Canadian International Development Aid (CIDA) for the purpose of providing communications island-wide in times of emergencies. It is an open repeater except when it is being used for its primary purpose. The frequency is 146.37/.97.

The original surveys as to the effectiveness of 2-meter communications island-wide were carried out many years ago by Alex Kasevich VP2MM and Bobbie Martin VP2MO using an FMH hand-held and a Drake TR-22C portable, and it was discovered that due to the volcanic structure of the islands, 2 meters proved very effective due to the number of reflections we were obtaining; this meant that with a transmitting station located atop any high point, communications could be maintained on a continuous basis.

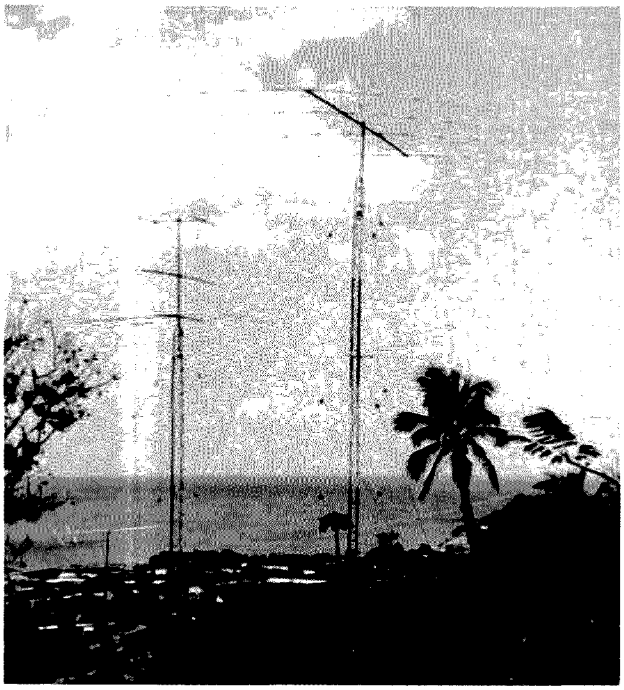
The Montserrat Amateur Radio Society has formed an Emergency/Disaster Team composed of at least 12 operators resident at various parts of the island who are always ready to go into action if required, and there is a daily preparedness net held via the repeater at 2230Z each evening. The net controllers are on a weekly rotational basis to give each the opportunity and training necessary to handle traffic. Each person has been issued an Icom IC-2 hand-held, spare batteries, converters, and other accessories to facilitate efficiency. Along with this daily exercise, there are regular island-wide simulated-emergency tests involving the entire membership.

Because of the valuable service that the Society has been rendering, the local government has awarded it import-duty-free concessions. These are limited to the members only, so visitors to the island are expected to pay the regular *refundable* deposit required by the system here. This deposit is based upon the value of the equipment that the individual is bringing in.

LICENSING AND OPERATING REQUIREMENTS

The island of Montserrat (which is 39-1/2 square miles and is a British colony) has reciprocal-licensing agreements (no third-party traffic) with many countries including the USA and Canada, and the following can prove very helpful to persons wishing to operate here. To obtain permission to operate on VP2M, one should (a) send a letter of application stating your estimated time of arrival, (b) the intended length of stay, (c) intended address while here, and (d) type of operation intended; include (e) a copy of your *national* license, (f) a request for acknowledgement of receipt, and (g) a bank draft or certified check in the amount of US$7.00 and an SAE with funds for return postage (no SASEs as foreign stamps cannot be used here).

Send to The Telecommunications Officer, Ministry of Communications and Works, General Turning Road, Plymouth, Montserrat, British West Indies. Please make your application at least 2 months prior to your intended time of arrival in order to allow enough time for processing and mailing.



The VP2MO antenna farm. (Photo by VE5RA)

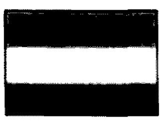
LICENSE JURISDICTION BOUNDARIES

Irrespective of the shady practices very evident today in some areas and the apparent disregard of what agreements really mean, under the reciprocal agreement obtaining a VP2M callsign does not in fact give one the right to export the call. In other words, the callsign issued by reciprocal agreement is *not valid outside of the host country*. If used under those circumstances, it is illegal and is subject to reprisals just the same as when any other law of a country is broken. In fact, a person who obtains permission to operate here is protected only as long as he is in the jurisdiction of this country; as such, he is subject to the laws governing Montserrat and by the same standards is not allowed to operate within this territory until such time as permission is applied for and obtained.

In the case of maritime mobiles, etc., those stations can operate while in international waters using their original calls/MM2, but just as soon as one enters territorial waters, one has to QRT the station until permission is granted (unless he has had prior permission). This topic has been the subject of much misunderstanding in the past, and hopefully this practice will cease to exist. If one is not aware of the requirements, one only has to ask around, for ignorance of the law is no excuse!

This misunderstanding, sometimes deliberate, has led many administrations to change their licensing system, reverting to portable calls or slash suffixes in a move to thwart these offenders, and as a result, much inconvenience has been caused to genuine DXers and contesters alike, and the objective is to stop issuing something that can be exported.

It's a real shame if it results thus, but we only have ourselves to blame.



THE NETHERLANDS

Henk Meerman, Jr. PD0DDV
Zandvoorterweg 33
2111 GR Aerdenhout
The Netherlands

TOP SCORE FROM DUTCH SWL

Dutch SWL Jan Steenbergen NL-213 has a top score on VHF and UHF. On two meters, Jan received the incredible number of 60 different countries, 58 of them confirmed. His best catch on two was Z56DN via transequatorial propagation. On 70 centimeters, Jan heard 35 countries and got 32 confirmations. Jan's best catch on UHF was JA9BOH with Earth-moon-Earth reception.

ATV RELAY

In the region of Doetichem, a few hard-

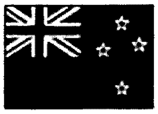
working amateurs are trying to construct an amateur television relay station. When this station is ready, they will place it near the village of Aalten in the eastern part of the Netherlands. Plans are to have FM input on 1275 MHz and an AM-CCIR output on 1252.5 MHz.

P14YK

P14YK is the call of a brand-new station that will be on the air for standard-frequencies broadcasts for the benefit of Dutch amateurs. The station also will broadcast RTTY standard test tones for alignment purposes with a very stable frequency. Furthermore, the station will be able to measure the deviation of signals received from counterpart stations in the two-meter band. Frequencies that will be used by P14YK are 3600 kHz, 144.800 MHz, and 432.800 MHz. The station will be on the air on the following dates this year: January 11, March 14, May 9, July 11, September 12, and the 14th of November. Transmission starts at 1900 UTC. The first operator of P14YK will be Piet van Weerlee PA0YZ.

THE FIRAC

About twenty years ago, those railroadmen who had ham radio as their hobby were united in the international union, La Federation Internationale des Radio-Amateur-Cheminots (the FIRAC). On the first of November of last year, the RANS (Radio Amateurs Nederlandse Spoorwegen), the Dutch division of the FIRAC, was begun. The purpose of the RANS is to strengthen national and international contacts between railway employees. At this moment, the local union has about 30 members.



NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

The space-shuttle flight of W5LFL was not very successful for ZL amateurs, as reported in last month's column. The reasons were no doubt attributable to the late launching of the shuttle, changed work schedules, rest times, and the space vehicle's 2m antenna not facing Earthwards when over our area.

Interested amateurs here were able to obtain orbit information, times, and frequencies for contacts with W5LFL through the ZL 80-meter AMSAT net on 3850 kHz nightly (the net was especially activated for information dissemination), ZL1MO doing a fine job in this direction. Other amateurs made trans-Pacific telephone calls to NASA to get updated orbital data. But all this was in vain because no ZL stations heard Owen transmitting, although many ZL stations tried transmitting on the various uplink frequencies without hearing W5LFL calling first. However, it could be that he copied some of these stations; we shall just have to wait for the list of confirmed QSOs, with interest.

Amateur satellites are an area of growing interest in ZL. We are fortunate to have Ian Ashley ZL1ADX as one of the AMSAT-appointed ground-command stations for the Phase III series of craft. Ian is always ready and willing to provide assistance and information to those who are interested in this facet of the hobby. As the Technician-class license in New Zealand is presently a non-Morse grade, some ZL VHFers in this grade are restricted in their satellite work; they are prevented from the use of Morse as a means of communicating through the various amateur satellites. As a consequence, the Phase-II-type satellites with their 2m uplink and 10m downlink frequencies are still very popular. The Russian RS-series satellites are proving very reliable in this respect.

OSCAR 10 is more of an obstacle as stations require a reasonable UHF SSB signal to access this craft, and this usually means the purchase of a 70 cm multimode rig or a transverter for the HF rig. Nevertheless, an ever-increasing number of amateurs in ZL are equipping themselves for operating through this bird. The tremendous DX capability offered by OSCAR 10 is a powerful incentive—from ZL locations, places as far away as Israel, Kenya, and Helsinki are just in range at various tmes during the orbit, and the ability to make contact with west-coast USA stations most of the time is also a real bonus.

The special-service channels on OSCAR 10 have so far seen little utilization "down under." Suggestions have been made to use one of these to distribute an IARU Region 3 bulletin with scope for local news inserts. This is already being done in Region 1 and seems to be working very well. Information on STS-9 was broadcast from OSCAR 10 and provided a welcome source of times when HF propagation was poor. Hopefully, some use of these special-service channels will be realized in 1984.

At a later date I will try to bring a report on the summer VHF/UHF DX season and the annual VHF/UHF Field Day activities (in February).

Field Day in ZL originated in the early 1930s as a means of testing the effectiveness of the newly-set-up ZL Amateur Emergency Corps, when most active branches went into the field with portable transmitters and receivers operated from dry batteries and stations exchanged messages up and down the length of ZL.

There is still an Amateur Radio Emergency Field Day each year to test the emergency communications network, but the real Field Day activity is the National Field Day in February, when branches of NZART set up stations in a field situation, operate from some form of portable power, and participate in a contest to find the top teams in each ZL district and overall winners for the whole country.

There are trophies for QRP, single operator only, CW only, etc., and last year 60 of the total of 79 branches were activated in the contest. The National Field Day preparations begin with the selection of suitable sites, and these vary from somewhere within city limits to isolated situations away from cities and towns. Once the sites have been selected, the next step is to organize the antennas to be used and prepare them in a knock-down state for quick and easy setting up on the morning of Field Day.

One of the rules governing this activity is that no part of the station may be erected before 10 am on the morning of Field Day, in preparation for the commencement of the first operating session at 1500 hours the same day.

So, once the antennas have been arranged, then the FD controller recruits operators, rigs, the portable power supply, and tents or other portable accommodations for the station and the operators who have to camp out overnight, and arranges a meeting to coordinate all these details. The operators who are manning the station have to attend to their personal requirements for food and sleeping if they are in the overnight group. There are usually a number of operators who attend for their operating periods and return home for overnight.

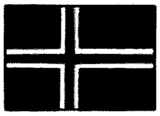
The contest operating periods are from 1500 to 2400 hours Saturday and from 0600 to 1500 Sunday. During that time, stations operate on 80 and 40 meters, phone and CW, under the usual contest setup, exchanging number groups for each contest. The operating periods are on an hourly basis, only one contact for each mode being permissible between stations each hour. The usual arrangement followed by most stations is phone for the first half hour and CW for the second half hour, throughout the contest. Location and propagation as well as operating skills play a big part in each group's activities, but come what may, most branch groups have a ball on Field Day.

There are always many humorous stories told at subsequent branch meetings about the various activities of the participants both on the air and during their rest periods. And also there are the hard-luck tales when rig failures, antenna problems, propagation, etc., robbed a team of their chances in the contest. But regardless of these problems, the really keen ones are always to the fore when the names are being collected for Field Day operators each year because it gives members a chance to get together in a picnic atmosphere, compete against the other branches of NZART, and enjoy themselves in a friendly competitive environment with plenty of time for operating and eyeball rag chewing between operating periods with other members of the team and visitors to the site. Of course, there is also the consumption of numerous 807s, TU1s, or whatever your special name might be for the proverbial bottle of beer, as February in ZL is the equivalent of July/August in the Northern Hemisphere; it is plenty hot and good mosquito weather usually, just the setting for camping out and increasing the liquid intake.

BITS 'N' PIECES

A recent visitor to ZL-land was W6REC/ZL0AJW (Duane Asherman) who has been hitchhiking throughout both main islands, meeting amateurs he has worked and talking to interested groups on the artificial heart project he was associated with several years ago in the States. Duane also is meeting with vintage motorcycle groups, too, as that is another of the interests he has.

While in our area, Duane attended a special meeting of the local branch and gave us a talk on the development of the artificial heart with the team he was involved with in Cleveland, Ohio, some years ago. The talk was received with great interest, and from the questions put to Duane, the members present were appreciative of his giving us the chance to hear his talk and meet him, even though just briefly. No doubt many of those he met made arrangements for QSOs when he returns home to California.



NORWAY

Bjorn-Hugo Ark LA5YJ
3120 Andebu
Norway

Welcome to a new year, and we are just getting used to writing 1984. DX activity has from my side been rather low, but we have managed to work VU7WCY, Laccadives, on several occasions. Unfortunately, this was not a new one, but we got him easily on 40m CW. Operation sounded very smooth and easy although the conditions and the signal were mediocre; the operation went rather easily on both expeditions. I reckon quite a few DXers spent some nice moments working him.

There is one thing that always surprises me: Even the average operator turns out to be a rather experienced operator after a while. The only difference between him and the very experienced operator is the speed and the stubbornness to keep on giving those 59 reports even if he is so tired that he is falling asleep between the QSOs. Others who seem to chat a lot about how great they are but haven't yet proved it in a contest seem to fall apart when placed under those stressful conditions. It is difficult to judge who will be a better operator, but it seems to me that the average serious DXer could do the job perfectly even if a little slowly in the beginning. It's just a matter of will and understanding.

Even if I haven't worked too many DX stations on the lower bands, I have spent some time monitoring 160, 80, and 40 meters and have on several occasions had the pleasure of hearing stations all over the world come through on 160. 80 has been as usual quite good, but not the big burst I have been used to. Other LAs have of course had some nice openings, but it's a matter of being at the right place at the right time. Since I have only the weekends to spend, the QRM level always rises quite a bit then, and one surely gets fed up with hearing those multi-kW guys with big antennas laying two or three kHz away from each other sitting there calling CQ DX hour after hour. Surely they are working some stations, but I'm sure they could have worked quite a few more with a little bit more listening. Very often a local W QSO is taking place on the same frequency, and as a result nothing transpires. You could, of course, go into the same business, but since your signal is not that spacy, they creep up on you, and I sincerely can imagine quite a few more pleasant things to do than messing around on a crowded 80-meter DX portion.

40 meters as always is great—signals pushing through from all areas, and if you have the possibility, get up a sloper, dipole, or inverted V and see for yourself what kind of result you may obtain. It's really amazing how good that band is.

Guess what I've done? I've computerized. Just purchased a CBM-64 and am starting to get familiar with the common Basic language. Looking into back issues of 73 for programs, but all the programs I seem to have use for are made for the TRS-80 or the ABC-80. Why couldn't someone have put in more programs for CBM-64 computers? I'm sure both the editors and the readers would like that very much.

The CBM-64 seems to have taken more of the market among radio amateurs in Norway. I'm really looking forward to a program taking care of my log books, band/mode, countries, and my 5-band WAS, with easy access to the information. The CBM-64 should have the capacity to handle this kind of stuff very easily.

I must say that this computer seems to make me feel more or less the same way I felt when presented with my first amateur station. For some funny reason, I did learn that quite easily though, so even if a few years have been added since then, I reckon I should be able to manage this new challenge as well.

The LA-DX group had, during January, another successful meeting in Oslo. This time they had made arrangements to include a visit of SM0AGD. Eric gave his famous speech based on his DX trip

around the Pacific Ocean. He presented his adventure in a very interesting manner. It was a great pleasure to meet him for the very first time. It is rather rare for us in Norway to be able to greet such accomplished hams on the DX front.

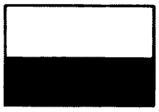
Eric himself used the opportunity to collect members for the NCDXA, and I sincerely hope that they will appreciate his efforts in California

This session was really quite an unforgettable one, and again, thanks to Eric for taking the time to visit us and to the LA-OX group tor the arrangement. It is absolutely recommended that you invite Eric SM6AGD if you wish to have a successful meeting.

We have just heard that several of the guys here in LA-land have been able to work ZL8AFH on Kermadec Island and that he is active even on 40 meters. Surely I can tell what my weekends will be occupied with until I land that new one for me. Actually, we sincerely hoped that Jim VK9NS would be able to go there, but it seems that this has been cancelled for the time being, so we had better concentrate on working the guy who's there.

As you probably know already, Clipperton is due and we are hoping that we'll be able to land it this time; after what I've heard, quite a few others are having the same hope.

I wish you good luck in your achievements both in DXing on the lower bands and in getting a new one.



POLAND

Jerzy Szymczak
78-200 Bialogard
Buczka 2/3
Poland

JUBILEE RADIOLOCATION CONTEST

The 10th Jubilee Radiolocation Contest organized in connection with the 40th anniversary of the birth of the Polish Peoples Army took place in Funka (Bydgoszcz province) in August, 1983. The Commander of the Pomeranian Military District, General Zbigniew Blechman, was an honored guest.

A higher technical standard was achieved in the 10th contest than in the 1st one, when referees shrouded in thickets had to become visible to do their judging. This time, a photodetector coupled with a crystal clock (the work of two designers from Bydgoszcz, S. Wilczynski SP2FLE and A. Owsianny SP2GJI) made it possible to gauge the time of competitors.

Eighty-one men and women competed from 13 district departments of PRAA (Polish Radio Amateurs Association), one contestant came from GFR, and one from GDR partook of the contest. On August 25th, the competition took place on the 3.5-MHz band. The terrain was broken up by hills and woods and was rather difficult. The length of the route for men was 5.5 km. Among 72 starting contestants, 28 did not end the race or went beyond the limit of time. The best men competitors found 5 or 4 senders in about 1 hour and the best women did the same in about 1 hour 43 minutes.

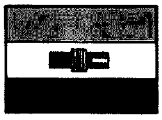
The competitions on 144 MHz were carried out on August 26th. The length of the route was 4.5 km. Also 81 took part this time. The times of the best competitors were from 36 to 51 minutes according to category.

By virtue of scores in both competitions, the best teams were the team of OD of PRAA, Bydgoszcz: Champion of Poland; the team of DD of PRAA, Lomza: Vice-Champion of Poland; and the team of DD of PRAA, Biala Podlaska: Second Vice-Champion of Poland.

Congratulations!

JUBILEE RADIOLOCATION WINNERS
(Champions and Runners-Up)

Individual	PRAA District
3.5-MHz Band	
Men	
1. Jerzy Wos	Bydgoszcz
2. Jaroslaw Palubicki	Lomza
3. Berndt Jurgens GFR	Leszno
Women	
1. Gabriela Banach	Bydgoszcz
2. Agnieszka Gizelska	Konin
3. Olga Prokowska	Szczecin
Juniors	
1. Slawomir Kaszubowski	Bydogoszcz
2. Jaroslaw Jaswinski	Lomza
3. Dariusz Besaraba	Poznan
Teenagers	
1. Jerzy Nicpon	Bydogoszcz
2. Dariusz Skiba	Leszno
3. Slawomir Fac	Lomza
144-MHz Band	
Men	
1. Jerzy Wos	Konin
2. Zenon Kuclak	Leszno
3. Telesinski Jerzy	Szczecin
Women	
1. Mariola Greboaz	Bydogoszcz
2. Olga Prokowska	Szczecin
3. Barbara Patoka	Ostroleka
Juniors	
1. Slawomir Kaszubowski	Bydogozcz
2. Marek Harasimowicz	Szczecin
3. Kazimierz Kraszewski	Lomza
Teenagers	
1. Pawel Smyk	Bydgoszcz
2. Jerzy Nicpon	Ostroleka
3 Dariusz Skiba	Konin



REPUBLIC OF SOUTH AFRICA

Bill ZS6XD, Chairman
Southern Africa DX Association
PO Box 48670
Roosevelt Park 2129
Republic of South Africa

NEWSLETTER, WEEK ENDING 1ST FEBRUARY 1984

One month into the DX year and the bands have been buzzing with activity despite poor band propagation on 10 and 15 meters. Predictions for the next 12 months vary from fair to poor as we slide further down into the low end of the 11-year cycle (which has still another two years to go before bottoming out!). 20 meters, however, should provide some very good openings and will be the DXer's band for many of those rare contacts.

Table 1 provides contact information from Eric ZS6ME which gives an indication of the band conditions. It is expected that the 40m and 80m bands will become more popular as 10 and 15 meters deteriorate.

XT2BR (Upper Volta) has been very active on 20 meters and can be heard most nights in a stateside pileup at 2100 UTC. Even from the back of his beam he can hear us! Also current and active for the next 4 weeks is OM Patrice 5T5RY in Mauritania. OM John CT2FR will be active from the Azores up until 1985. Look for him on 20m at ± 2100 UTC.

WHAT IS SADXA?

SADXA was formed in June, 1983, by a group of South African DX operators with the aim of assisting DXers and newcomers to DX with information regarding DX operations and techniques. The founder of SADXA was the late Mike Sherman ZS6IW, who put forward the idea of a number of prominent South African DXers. Other founder members are Bob Hooper ZS6AEV, Bill Smith ZS6XD/H5AHF, Sam Ford ZS8BRZ, Eric Meyer ZS6ME, and Julius Lieberman ZS6AF/4Z4NY.

The aims of SADXA are many, but among them is the aim of improving amateur activity on the African continent by assisting newcomers to the hobby in countries where equipment cannot be obtained or, if available, is exorbitantly priced, by donating equipment, QSL cards, etc., and offering assistance, where possible, with the setting up of new stations.

DXpeditions are also a major part of the SADXA operations, and the general aim is to have at least one a year. Likely locations are Bouvet Island (3Y), Malawi (7Q), Botswana (A22), Heard Island (VK), and Marion Island (ZS2MI).

To its members, SADXA will provide, in the form of a monthly newsletter, the latest news of DX operations and DXpeditions worldwide, times, dates, and frequencies of operation of rare countries and stations, news of forthcoming events, and general information and news regarding OXing, i.e., QSL info, propagation predictions, etc.

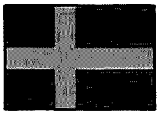
SADXA will also, in the not-too-distant future, conduct an HF net on one of the bands. Details about that will be published in the newsletter. At the moment, a DX Alerting Net is operational on 144.975 MHz in the Witwatersrand area, and we hope to expand that to a 40m net as well.

Also in the pipeline is an "Africa Calling . . ." DX contest in which the aim will be to contact as many stations on the continent of Africa and in the Indian Ocean area as possible during a 24-hour period. An annual trophy, the Mike Sherman Memorial Trophy, will also be instituted and will be awarded to the ham that, in the judgment of the SADXA committee, has done the most for the DXing aspect of our hobby in that year.

As can be seen, SADXA is an organization worth belonging to, and without members to support us, we cannot grow or do what we would like to do. Interested? Write us for application forms!

CW			
PZ1AP	Surinam	14 MHz	20007 UTC
VP9DR	Bermuda	14 MHz	1816
VO1GC	Newfoundland	14 MHz	1822
TU2DD	Ivory Coast	14 MHz	1800
EA2DY	Spain	21 MHz	1920
HI3PC	Dominican Republic	14 MHz	2100
GJ2LU	Jersey Island	28 MHz	1002
YB4FN	Indonesia	28 MHz	1100
7PSCL	Lesotho	14 MHz	1840
LX4FE	Luxembourg	14 MHz	1834
SSB			
A4XRS	Oman	7.074	1834
VS5GA	Brunei	14.114	1605
4S7PVR	Sri Lanka	14.272	1853

Table 1.



SWEDEN

Nils-Gustav Strom SM5EEP
Kampavagen 1
S-773 00 Fagersta
Sweden

THE "CHEAP TRICK" TVRO NOW ALSO IN SWEDEN

In my part of the world TVRO equipment is still not very common. *QTC*, the Swedish ham magazine, has not yet published any material about satellite TV, but as a subscriber to *73* magazine during 1982, I devoured articles about satellite TV. I decided with help from these articles to build Dwight Rexroad's "Cheap Trick" (*73*, September, 1982: "The $100 TVRO Receiver," Stephen Gibson) and bring down the Russian TV satellite (4 GHz) Ghorizont, which has 3 transponders. Transponder No. 1 is available in Sweden.

I succeeded with the Cheap Trick and can now watch Russian television. I do not care much for the East Block propaganda, but I do recommend the children's (circus and sport) programs. Before telling you about the hardships with the Cheap Trick, I would like to tell you a little about myself.

My profession is associated with electrical power equipment (motors, generators, transformers, etc.). When I was in school, the transistor was not mentioned in the books! I have always been interested in pictures, but I am a lousy photographer.

On my own, I have tried my best to follow modern technology. My first project was to build a small black-and-white TV set equipped with VHF, UHF, and video input and output. This television set has later been very useful in other projects. As an old man (or at least well over forty), I got my ham certificate in 1971.

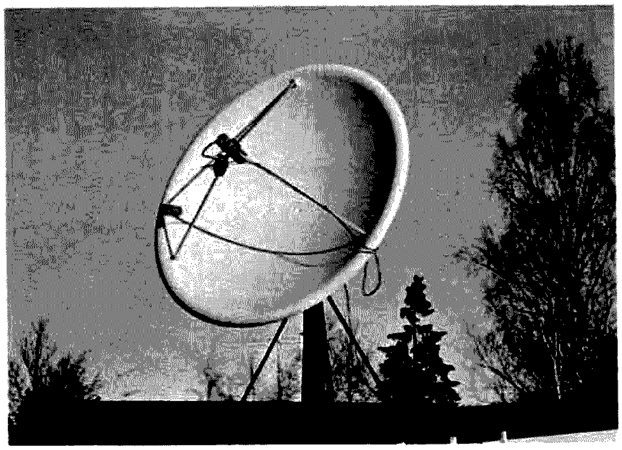
However, I wanted to do something other than operate in voice and code via my station. One by one, I have done projects for gear which no other Swedish hams have! This has meant that I have not been able to discuss them with anyone. The projects have been relatively difficult. They always had their origin in the United States. The projects were:

- 1975: SSTV monitor and flying spot scanner (W9NTP), the only one in Sweden!
- 1978: SSTV keyboard (W6LMD), the only one in Sweden!
- 1983: TVRO, Cheap Trick (Rexroad), the only one in Sweden for the present.

As you can see, I have SSTV very much at heart and I am now on the air, color SSTV, in the 24-sec. mode.

For the Cheap Trick project, Rexroad suggested a parabolic antenna as well as an LNA. Where to get hold of this equipment in Sweden where only the Russian Ghorizont (with factory-made TVRO equipment) can be seen? However, there are 2 or 3 commercial firms which are getting prepared for the real satellite-TV wave around 1985-1986. Fortunately, these firms happen to have hams on their staffs.

OM SM5EEP with the Cheap Trick.



SM5EEP's antenna.

Reception from the Ghorizont. This improved after further aiming of the antenna.

I managed to get a warped antenna and a laboratory LNA (GaAsFET/NE21889) at a very low price. The LNA took 100 mA which is no guarantee for perfect function! Although I had only 40% of Rex's requirements, I decided to go ahead with the project.

I started to obtain the parts necessary in November, 1982, and in December all the PCBs were etched and equipped according to Rex's instructions. A few parts were imported from the United States. The deliveries always arrived promptly. During the winter the project was suspended, but it came alive again in the summer. The antenna was mounted before the summer holidays. The problems began in the starting-up procedure. How and where should I start the alignment?

There was no TV satellite receiver to borrow in Sweden. Nor did I know any owner of a spectrum analyzer or a sensitive counter. I was nearly desperate, but a certain Mr. Mac Palomaki from one of the commercial firms promised me he'd check my downconverter (MRF901). According to Rex's instructions, we made 3.2 GHz. One element that was OK!

I now moved up to the garage roof to test the antenna, the LNA, and the downconverter, which gave 500–600 MHz corresponding to the UHF channels No. 23-25 in the Swedish TV system. If all details functioned and the signal was fed into a TV set, I should get video sparklies or at the best a very bad picture. I got a bad picture which later was aligned to best quality. I continued my work in the garage where Rex's receiver was to be aligned step by step. The UHF tuner was a problem.

The input was altered according to Rex's instructions, but in the output only R20, C10, and C28 were removed. L18 and C26 were replaced by 1000 pF. Consequently, no broadband transformer. Now I got 70 MHz, but pin 1 was fed with about + 1.75 V.

The 70-MHz filter was aligned with an ordinary signal generator with an output of 50 Ohms and a very even output level.

The transformer, T1, caused a lot of trouble in the baseband block. Finally, I found the right connection and the 70-MHz signal could be divided.

The video- and audioblock caused no problems, so I could peacefully watch a perfect black-and-white picture on my homemade TV set. Now I began to align all the circuits starting at the antenna and the LNA. As the RG-59 cable had now been led into my house, the working conditions were now more pleasant!

One last problem to overcome! Ghorizont transmits through the SECAM system while we use the PAL system in Scandinavia. There are, however, now PAL/SECAM TV sets on the market, so of course I got hold of one. By using my VTR, I can now enjoy Ghorizont in color. The quality is 95%, which is very good. The missing 5% is to be found in the warped antenna and the dubious LNA!

Rex, thank you for this project! It took me some time, but I am presumably the only lucky person in Sweden to have experienced this miracle.

THAILAND

Radio Amateur Society of Thailand
PO Box 2008
Bangkok
Thailand

SECOND GENERAL MEETING, 1983

Mayuree Chotikul HS1YL presided. There was introduction of new members, including foreign guests who were attending the meeting.

The society attended the 13th meeting of SEANET Convention at Singapore. 13 representatives from RAST attended, joining some 200 delegates from other countries. The meeting voted that the 14th SEANET Convention, scheduled for 1984, would be held in Malaysia.

Sombat Tharincharoen HS1BV, treasurer, reported that the grand total remaining was 69,706.75 baht [c. US$3,000].

Hans Hoilstein HS1BG, secretary, reported that Victor C. Clark W4KFC, president of the ARRL (American Radio Relay League), died of heart failure on November 25, 1983, and that he was going to send a cable of condolences in the name of RAST to the League.

The Central American country of Belize (for which the prefix is V3) is applying to become a member of IARU World Association and asked for a vote of support from RAST. The meeting unanimously voted to admit the country.

The Asian Institute of Technology (AIT) at Rangsit has given informal permission for RAST to use the site as a place for permanent contest operations.

A total of 161 countries were contacted during the CQ WW CW contest on November 26–27 from a station set up at AIT, and Thailand expects to rank about sixth with an estimated 625,000 points.

For future CW contests, a consensus was sought to use the callsign HS0A which is a good call for that mode. The meeting unanimously approved this.

Election of executive committee members for 1984 resulted in the following: president: Chamnong Phiromphakdee HS1WB; first vice president: Mayuree Chotikul HS1YL; second vice president: Prof. John Hugh Jones HS1AIT; secretary general: Hans D. Hoilstein HS1BG; deputy secretaries: Chaiyong Wongvudhikamchom HS1BL and Sombat Tharincharoen HS1BV; treasurer: Rasdaphorn Bunphithak HS1DC; duputy treasurers: Kamol Choosri HS1DG and Yukluechai Pramitithanakan HS1YP; members at large: Chester Davis HS1AIM, Athit Chuenchamnong HS1EK, Sahas Bhukkaman HS1WC, Banchorn Pramitithanakan HS1JK, Thawatchai Suthavanich HS1HT, and Surapong Srivinich HS1NA; bulletin manager: Hans Hoilstein HS1BG; deputy QSL manager: Tony Waltham HS1AMH; public relations managers: Tony Waltham HS1AMH and M.R. Chakarin Vorawan HS1VV; registrar: Khun Phachern Singhaphalin HS1DH and Kijja Naksomphop HS1KJ; lawyer: Dr. Gunn Nakhamdee.

INVITATION TO VISITORS

The Radio Amateur Society of Thailand holds regular monthly meetings which all foreign radio amateurs and SWLs visiting Bangkok are invited to attend.

The club's committee is pleased to inform anyone who may be visiting Thailand during the first Sunday of any month that the society now meets at the Singha Bier Haus on Asoke Road.

An excellent buffet luncheon is provided, and meetings begin at 11:00 am. A feature of the meeting is usually a talk or demonstration relating to amateur radio, as well as the usual informal get-together.

TRINIDAD AND TOBAGO

John L. Webster 9Y4JW
c/o Department of Soil Science
University of the West Indies
St. Augustine
Trinidad
West Indies

The TTARS welcomed the arrival of 1983, especially due to its designation as World Communications Year and the obvious emphasis that would be placed on communications. The TTARS has always found it difficult to create an awareness in the local public of amateur radio. Trinidad and Tobago, being the most southerly of the Caribbean islands, tend to escape the destruction often wreaked in the more northerly Caribbean islands by the passage of hurricanes.

These hurricanes, although very destructive to homes, property, and agriculture in the Caribbean area, have actually been a benefit to the ham population. The governments in the affected islands have recognized the importance of encouraging amateur-radio operations and have usually extended a variety of privileges to hams, including duty-free concessions on imported amateur-radio gear. This has been very good for the growth of the ham community in this area, where income is often quite limited.

Unfortunately, in Trinidad and Tobago the importance of amateur radio has yet to be appreciated. Many persons either do not understand or do not know about amateur radio, and it is often confused with CB, which is illegal in this country. This confusion has, on occasion, led to the harassment of licensed radio amateurs by the police.

The Executive of the TTARS recognized the benefits that could be derived from WCY and devised a public-awareness and -education program for 1983.

This program took the form of a series of TV interviews with members of the TTARS during which they discussed most aspects of amateur radio, demonstrated ham equipment, and displayed some samples of home-brewed equipment. Throughout the interview series, viewers were encouraged to contact the TTARS, and many did.

There also were radio interviews on the local broadcasting stations, and two of the ARRL films were screened during prime viewing time on the local TV station. The films screened were "The World of Amateur Radio" and the one on Dr. Owen Garriott's planned operation from the space shuttle, *Columbia*. This was quite an achievement for the TTARS, as it was previously almost impossible to get an amateur-radio film screened at all.

The public-awareness program culminated in participation by the TTARS in a large government-sponsored exhibition on communications. This exhibition was held during the last week in October and will be the subject of the second part of this review in my next column.

The TTARS participated in several other events during 1983. The annual simulated-emergency test was conducted in June. Participating stations used only emergency power, and many of the newer hams were introduced to message handling while operating from remote locations.

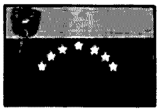
Our president, Nick Percival 9Y4NP, attended the IARU conference in Cali, Colombia, during the first week of July. At this conference, Nick was the official representative of both the TTARS and the Amateur Radio Society of Barbados (ARSB). Later in the year, in October, he once again represented the TTARS at the World Amateur Radio International Conference (WARIC) in Tokyo, Japan. Here Nick had the rare privilege of being the unofficial representative of an entire continent—there was no one else representing South America!

In the first half of the year, the TTARS and ARSB jointly created history by linking the islands of Trinidad and Barbados on two meters. After several years of planning, the 9Y-8P link repeater was installed and has been operating since with varying degrees of success. Details of this system will be the subject of a future column.

While on the subject of repeaters: The local repeater has for many years operated on 146.34/.94 from a remote site in the central mountain range in Trinidad. It actually shares the location with the repeaters for Amoco (oil company). From early in 1983, the repeater was on the air sporadically and the trouble was traced to lengthy power outages in the area causing the backup battery system to become exhausted. On one occasion, the battery charger was damaged by the power fluctuations. Hams had, therefore, become accustomed to finding .34/.94 not on the air. With the introduction of the link repeater system, they simply switched to that frequency until .34/.94 returned to the air.

In mid-October, .34/.94 once again disappeared from the air. After a week had elapsed and it still had not returned, our technical officer, 9Y4AR, decided to investigate. We were all shocked to learn that the repeater hut had been broken into and our .34/.94 machine, standby battery, and charger had all been stolen! Amoco also lost some of its equipment. Fortunately, our duplexers were left behind, probably because they were firmly bolted down to the floor. Up to the time of writing this column, the items have still not been recovered and the TTARS is making plans to purchase a new repeater in 1984.

Well, until next time, 73 and good DXing.



VENEZUELA

Luis E. Suarez OA4KO/YV5
PO Box 66994
Caracas 1061-A
Venezuela

There are several radio clubs in Venezuela. Most are local clubs with small memberships. The Asociacion de Radioaficionados de Venezuela (ARV) and the Radio Club Venezolano are national organizations with memberships ranging in the thousands.

The ARV was established in Caracas on January 24, 1967. It has 43 Seccionales (branches) in all 9 call areas. At this time there are 7 more Seccionales almost ready to be established. As a demonstration of democracy, the ARV bylaws specify that the board of directors' HQ would be in major cities of the country on a rotational basis. That's because the ARV has a dynamic modern organization based on goodwill and hard work.

The current national board of directors includes the following members: Jose YV5AEX, Francisco YV3ARE, Manuel YV5ETV/3, and Nicanor YV5FVN. The general coordinator is Marichal YV5FTU. This board has been on duty for the past two years. The ninth national convention will take place in Guacara, Carabobo State, next July.

This dynamic association manages the most reliable and trustworthy QSL bureau in YV-land. At this time, in Caracas the bureau is managed by Ramon YV5FAA.

Besides all those normal activities of a radio club, currently the ARV members are carrying out technical seminars and, at this moment, they are arranging an expedition to the widely-known Angel Falls. This, no doubt, is a major event for the year. Nevertheless, the ARV fraternity feels that there will be many important happenings during 1984.

The seminars are organized by coordinator Ramon YV5EED, a young medical doctor, and are scheduled four times a year. The central subject is selected by consensus. The first one was "The Two-Meter Band" in October; the second was "Operational Practices" this January. The third was programmed for April on "Satellites."

RADIO BULLETINS

YV5ARV, the ARV's station in Caracas, broadcasts a weekly bulletin on 7,100 kHz every Saturday at 1700 UTC. Each official station at each of all 43 Seccionales joins in. I recommend to all DXers that they keep the list of all 43 stations for future reference (see Table 1). The meeting lasts several hours due to the large number of participants (jammers included).

NETS

The Red Venezolana de Radioaficionados Net is scheduled daily on 3,760 kHz at the following times: 1100–1300 UTC by Eliseo YV1CCV, 1600–1730 UTC by Tirso YV4CYF, and 2200–2400 UTC by Nubia YV3BOS. The Red Net Internacional YV is held Monday to Friday at 0100–0200 UTC on 14,130 kHz. This very well known Latin American net began during 1968 and is currently conducted by Primitivo YV5EPP. Anybody, anywhere, looking for any city in Latin America is encouraged to joint the net. It is also supported by the local 2-meter FM net of repeaters.

At this time they do not sponsor any certificate, but soon they will be announcing something. They own two 2m-FM repeaters, one at Coro (YV1) 147.300 +600 that covers part of the Netherlands Antilles and the second is near Caracas at 147.090 +600. This is also very often activated by DX stations from the Caribbean area and Argentina, too.

Of course the ARV has also a national coordinator for civil defense and is, hence, a link with government authorities in the event of disasters. He is responsible for calling the emergency net if needed.

EXPEDITION TO CHURUM-VENA

The Pomones, aborigines who populate the lands to the south of the Orinoco river, call the widely known Angel Falls "Churum-Vena." This name is mistaken by many people, even in Venezuela, and many times it is heard that the original name of the Angel Falls is "Churum-Meru." In fact, expeditions there are advertised as expeditions to the Churum-Meru, and people think this is the name of the falls. I'll explain, so keep reading.

To make a visit to the Angel Falls, it is necessary to take a plane trip to Canaima National Park. The park has an area of 30,000 square kilometers—almost as large as the whole area of Belgium. Northwest of this park, on the banks of Canaima Lagoon, there is a site facing Hacha Falls named Canaima Camp. The camp is sponsored by a national airline. The Hacha Falls are a wide series of falls similar to those at Niagara but with not so much volume of water. At the foot of the falls, the Carrao river widens to two times its normal width and forms a lagoon. All around this territory there are big, flat-topped, rock mountains whose straight sides rise abruptly; they are named tepuys by the aborigines and plateaus by geologists.

The Canaima Camp has cabins all around the place for the guests arriving at the park. A dining room, bar, and other

Name	City	State	Call
Circuito 1			
General Rafael Urdaneta	Maracaibo	Zulia	YV1ARV
Catatumbo	Cabimas	Zulia	YV1ARC
Loas Motilones Perija	Machiques	Zulia	YV1LMP
Jose Leonardo Chirinos	Coro	Falcon	YV1RV
Mariscal Juan Crisostomo Falcon	Punto Fijo	Falcon	YV1APF
Luis Pena Vazquez	Valera	Trujillo	YV1LPV
Circuito 2			
Camilo Prato Fernandez	San Cristobal	Tachira	YV2RV
Somos Los Comuneros	San Antonio	Tachira	YV2SLC
Cinco Aguilas Blancas	Merida	Merida	YV2CAB
Luz del Paramo	Tovar	Merida	YV2LDP
Sur del Lago	Ciudad Bolivia	Merida	YV2SDL
General Pedro Briceno Mendez	Barinas	Barinas	YV2ARV
Alfredo Arbelo Lariba	Barinitas	Barinas	YV2SAL
Circuito 3			
General Juan Jacinto Lara	Barquisimeto	Lara	YV3RV
Pio Tamayo	El Tocuyo	Lara	YV3ARV
Jose Vicente de Unda	Guanare	Portuguesa	YV3JVU
General Jose Antonio Paez	Acarigua	Portuguesa	YV3JAP
Circuito 4			
Pedro Fonseca Ferguson	Valencia	Carabobo	YV4AK
General Jose Felix Ribas	Maracay	Aragua	YV4RV
Circuito 5			
Santiago de Leon	Caracas	D.F.	YV5ARV
Doctor Jose Maria Vargas	La Guaira	Miranda	YV5JMV
Gran Cacique Guaicaipuro	Los Teques	Miranda	YV5GCG
Vicente Emilio Sojo	Guarenas	Miranda	YV5VES
Guarico	San Juan de los Morros	Guarico	YV5DJR
Francisco Lazo marti	Calabozo	Guarico	YV5FLM
El Sombrero	El Sombrero	Guarico	YV5SES
Circuito 6			
General Pedro Maria Freites	Barcelona	Anzoategui	YV6PMF
General Jose Antonio Anzoategui	Puerto La Cruz	Anzoategui	YV6ARV
Cacique Oriental Paramaconi	El Tigre	Anzoategui	YV6COP
Caroni	Puerto Ordaz	Bolivar	YV6RV
Orinoco	Ciudad Bolivar	Bolivar	YV6RB
Circuito 7			
Guillermo Tovar	Carupano	Sucre	YV7CR
Gran Mariscal de Ayacucho	Cumana	Sucre	YV7GM
General Juan Manuel Valdes	Guiria	Sucre	YV7JMV
General Francisco Esteban Gomez	Portamar	Nueva Esparta	YV7RV
Circuito 8			
Fray Lucas da Zaragoza	Maturin	Monagas	YV8RV
Benigno Jose Guarecuco	Tucupita	Delta Amacuro	YV8BJG
Circuito 9			
Teniente Pedro Camejo	San Fernando de Apure	Apure	YV9TPC

Table 1. Branches of the Asociacion de Radioaficionados de Venezuela.

facilities are on the hill above the river bank. Almost daily several excursions depart from the camp to the nearby waterfalls. Most last for a couple of hours. If the weather is good, the airline routes its planes near the falls so that you can appreciate them from the air before landing or after departure. The fact is that if weather is OK to see them by air, it is not good for going to the falls on the ground, for ground travel is by river, and good weather means no rains and too shallow waters for the canoes.

The Churum-Vena are some 40 km southeast of Canaima Camp. The Falls' expeditions go on 5-day round trips up the river during the rainy season when the river is high (from June to December), by motorized canoe. The expeditioners carry coats, sleeping bags, blankets (nights are cold), hats, etc. This *river* is named Churum-Meru, and *that's* why some people think the waterfall name is Churum-Meru instead of Churum-Vena.

The plateau is named Auyan-Tepuy and only very few people have been up there. There is a man that lives nearby and knows how to go up, but he doesn't want to reveal the secret to any except the very few who are guided by him. Most expeditions to the top of the plateaus go from the west side of the plain and take several weeks; these are not recommended for tourists. The 7-day trip to the foot of the waterfalls is not recommended for children less than 15 years old.

The falls start from a river formed 70 meters below the surface of the plateau. The free fall plunges 980 meters—that's 20 times as high as Niagara Falls. The underground river is formed by the rain that falls over the plateau and then seeps through the fissures in the terrain. Most of the area atop the plain is swamp and the air is damp and warm. The plain is accessible by air only from mid-March to mid-May. The rest of the year it is covered by a heavy fog.

On the tepuys small black scorpions live, a species that has existed for 500 million years. Also there is a small black toad that cannot jump; instead, he walks and climbs over the moist rocks. The soil is very poor and there are strange plants unique to the area. Because of poor soils, many plants populating the area get their nutrients from insects; they are known as carnivorous plants. But don't worry; they won't eat hams!

It is atop the Churum-Vena, in the Auyan-Tepuy, that 12 amateurs from the ARV are planning—as I write this—to call CQ on March 30, 31, and April 1. The station's special call is 4M5ARV/6 and they plan to transmit on 6 bands and in three modes. The most important thing is that by the time you read this, an amateur-radio expedition may have taken place to this remote and unique location.

DEALER DIRECTORY

Culver City CA

Jun's Electronics, 3919 Sepulveda Blvd., Culver City CA 90230, 390-8003, Trades 463-1886 San Diego, 827-5732 (Reno NV).

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Complete lines ICOM, DenTron, Ten-Tec, Mirage, Cubic, Lunar, over 4000 electronic products for hobbyist, technician, experimenter. Also CB radio, landmobile. Fontana Electronics, 8628 Sierra Ave., Fontana CA 92335, 822-7710.

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Preston ID

Ross WB7BYZ has the largest stock of amateur gear in the Intermountain West and the best prices. Call me for all your ham needs. Ross Distributing, 78 So. State, Preston ID 83263, 852-0830.

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The reliable ham store serving NE. Full line of ICOM & Kenwood. Yaesu HTs, Drake, Daiwa, B&W accessories. Curtis & Trac keyers. Larsen, Hustler, Telex/Hy-Gain products. Mirage amps., Astron P.S., Alpha Delta protectors, ARRL & Kantronics instruction aids. Whistler radar detectors. Full line of coax fittings. TEL—COM Electronic Communications, 675 Great Rd. (Rt. 119), Littleton MA 01460, 486-3400/3040.

Ann Arbor MI

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Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the August '84 issue must be in our hands by June 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14	14	14	7	7	14	14A	21	21A	21A	21
AUSTRALIA	21	14	14	7B	7B	7B	7	7	7B	7B	14A	14A
CANAL ZONE	14A	14	14	7	7	7	14	14	14	14A	21	21
ENGLAND	7A	7	7	7	7	7A	14	14	14A	14A	14A	14
HAWAII	21	14	14	7B	7	7	7	7	14	14	14	14A
INDIA	14	14	7B	7B	7B	7B	14	14	14	14	14	14
JAPAN	14A	14	7B	7B	7B	7	7	7	14	14	14	14
MEXICO	14A	14	14	7	7	7	7	14	14	14	21	14A
PHILIPPINES	14A	14B	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	14	7A	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7B	-7	7	7B	7B	14	14	14A	21	21A	14	14
U. S. S. R.	14B	7	7	7	7	7B	14	14	14	14A	14A	14
WEST COAST	14A	14A	7	7	7	7	7	14	14	14	14A	14A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	14	14A	21	21A	21A	21
AUSTRALIA	21	14A	14	7B	7B	7B	7	7	7B	7B	14A	14A
CANAL ZONE	21	14	14	7	7	7	14	14	14A	14A	21A	21A
ENGLAND	7A	7	7	7	7	7	7A	14	14	14	14A	14
HAWAII	21	14A	14	7	7	7	7	7	14	14	14A	14A
INDIA	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
JAPAN	14A	14A	14B	7B	7B	7	7	7	14	14	14	14
MEXICO	14	14	7	7	7	7	7	7A	14	14	14	14
PHILIPPINES	14A	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	21	14A	14	7	7	7	14	14	14	14A	21	21
SOUTH AFRICA	7B	7	7	7B	7B	7B	14	14	14	14A	14	14
U. S. S. R.	14B	7	7	7	7	7B	14B	14	14	14	14	14

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	3A	3A	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	7B	14A	21	21A	21A	21
AUSTRALIA	21A	21	21	14	14	14	7	7	7B	7B	14A	21A
CANAL ZONE	21	14	14	7	7	7	7A	14	14	14A	21A	21A
ENGLAND	7AB	7	7	7	7	7	7B	14B	14	14	14	14
HAWAII	21A	21	14A	14	14	7A	7	7	14	14A	21	21
INDIA	14	14	14	14	7B	7B	7B	14B	14	14	14	14
JAPAN	14A	14A	14	14B	14B	7	7	7	14	14	14	14A
MEXICO	14A	14	14	7	7	7	7A	14	14	14	14A	14A
PHILIPPINES	14A	14	14	14B	14B	7B	7B	14B	14	14	14	14A
PUERTO RICO	21	14A	14	7	7	7	7	14	14	14	21	21
SOUTH AFRICA	7B	7	7	7B	7B	7B	7B	14	14	14	14	14
U. S. S. R.	14B	7B	7	7	7	7B	7B	14B	14	14	14	14B
EAST COAST	14A	14A	7	7	7	7	7	14	14	14	14A	14A

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

May

SUN	MON	TUE	WED	THU	FRI	SAT
		1 G/G	2 F/G	3 F/F	4 F/G	5 F/G
6 F/G	7 F/G	8 G/G	9 G/G	10 G/G	11 F/F	12 P/F
13 P/F	14 F/F	15 F/G	16 F/G	17 G/G	18 G/G	19 G/G
20 G/G	21 F/G	22 P/F	23 F/F	24 G/G	25 G/G	26 G/G
27 F/G	28 F/G	29 G/G	30 G/G	31 F/F		

73 T.M.

9 New Projects You Can Build!

Flashy British Transistor Tester
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Sweeps Winners
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Rate Your Club
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Simple Rf Frequency Counter
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Easy DVM
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VIC-20/C-64 Code
Page 38

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June 1984 Issue #285
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Amateur Radio's Technical Journal

A CWC/I Publication

Kinabalu—76

2m Madness—20

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74470 65946

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

DUMB WAYNE

Word of a petition I submitted to the FCC having to do with CW was published in abbreviated form in *QST*. Working on the basis of this biased report and without giving the situation much thought, a few Chicken Littles have been yelling wolf, if I may mix my metaphors. Actually, I think that without exception the reaction has been to attack me personally, not my ideas. I'm used to that.

In a classic case of projection, I'm classed as dumb by amateurs who haven't been reading *73* and thus don't understand what I'm doing. Hey, they may not agree with what I think or do, but if they ascribe dumbness as a factor, they're in trouble.

So what in hell is Wayne up to, anyway? Well, it is simple in some ways, but not quite obvious unless you read things carefully all the way through and then think about it. You *73* readers are used to that—indeed, that may be one of the things that sets you apart from the others.

Let's look at the basic situation. We have a dying hobby—amateur radio. Twenty years ago, 75% of the newcomers were teenagers. Now, not only do we have very few newcomers, but of the ones we do have, only about 25% are teenagers. Thus not only is amateur radio drying up as a market and as a hobby, but also it has almost totally dried up as a source of high-tech career people. This last has, I believe, done serious damage to our country.

Now, I suppose that it is quaint of me to worry about the United States. And it is even sillier for me to let my feelings for my country influence what I do. But I see amateur radio as having two major responsibilities to our country—one as a way to attract youngsters to high-tech careers and the other as the only real backup we have for communications in case of a nuclear attack.

Neither of these is a simple matter. But I can't help but take emergency communications seriously when President Reagan tells us that a survivable emergency communications service would be one of the best deterrents to an atomic attack yet. This makes eminent sense.

If I didn't think it made sense, I would not have devoted the last few years to working with the FCC's National Industry Advisory Committee and the last 18 months also to the FCC's Long-Range Planning Committee (for emergency communications). I've made many trips to Washington at my expense for these committee meetings and have been one of the more active participants right from the beginning.

By virtue of my position with the committees and my discussions with the FCC Commissioners, I have a fairly good understanding of the state of the art of emergency communications at present for all of the communications services. I've written about this before, so it should not be a news flash. I don't think I'm letting any secrets out if I tell you that other than amateur radio, there are few real plans for coping with any serious emergencies by the commercial radio communications systems. The worst part of it is that you may imagine that amateurs have some sort of wonderful secret plan. Sorry about that, but there's virtually nothing!

Amateurs have taken the lead in coping with emergency communications needs for many years—and we've done rather well, all things considered. These past emergencies have taught us some lessons which

Continued on page 88

QSL OF THE MONTH

To enter your QSL, put it in an envelope along with your choice of a book from *73*'s Radio Bookshop and mail it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not in envelopes or without a book choice will not be accepted.

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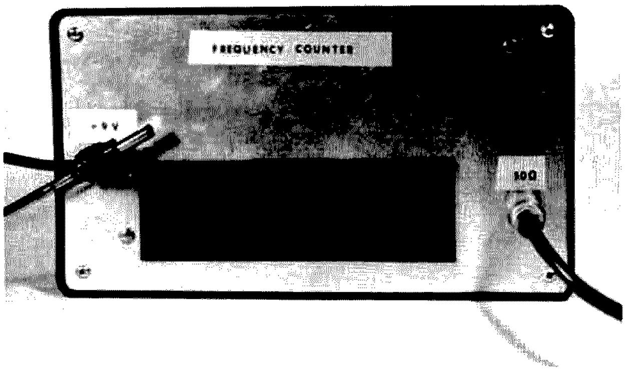
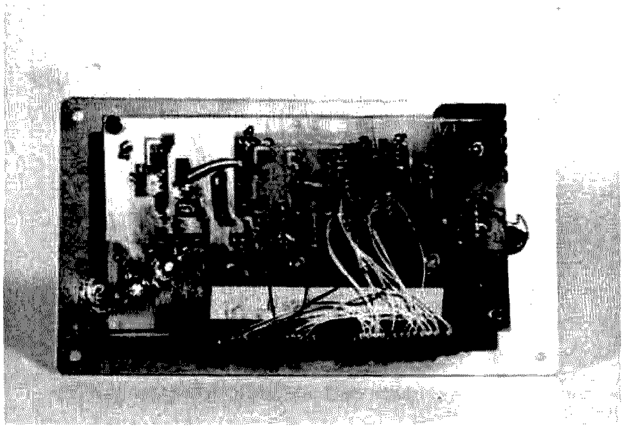
Easy Berardi Building

You can count on this simple frequency counter from Arizona.

Joseph Berardi
14213 N. 38th St.
Phoenix AZ 85032



Front view.



PC board, foil-side view.

This is a construction article for building a very simple, high-quality frequency counter. My home-made counter uses the very popular Intersil ICM-7216-D counter chip and the Fairchild 11C90 prescaler. Just add a few discrete components, some LED displays, another three ICs and we have a very professional-looking frequency counter. I built this counter on a 3″×6″ printed circuit board and installed it in a small lightweight enclosure. The counter design is essentially lifted right out of the appli-

W1	U1-3 to DS2-9
W2	U1-4 to DS2-7
W3	U1-5 to DS2-8
W4	U1-6 to DS2-6
W5	U1-8 to DS1-9
W6	U1-9 to DS1-8
W7	U1-10 to DS1-7
W8	U1-11 to DS1-6
W9	U1-15 to DS1-1
W10	DS1-1 to DS2-1
W11	U1-16 to DS1-14
W12	DS1-14 to DS2-14
W13	U1-17 to DS1-13
W14	DS1-13 to DS2-13
W15	U1-19 to DS1-3
W16	DS1-3 to DS2-3
W17	U1-20 to DS1-11
W18	DS1-11 to DS2-11
W19	U1-21 to DS1-4
W20	DS1-4 to DS2-4
W21	U1-22 to DS1-12
W22	DS1-12 to DS2-12
W23	U1-23 to DS1-5
W24	DS1-5 to DS2-5

Table 1. Wiring guide.

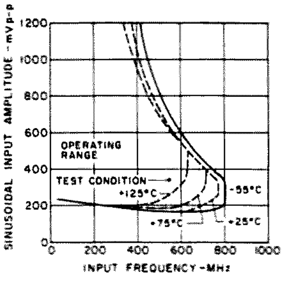
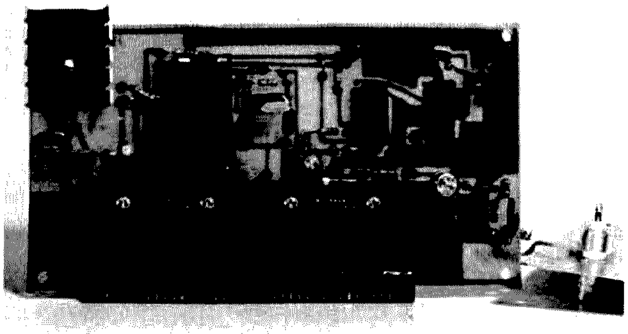


Fig. 1. Operating range of the 11C90.

Frequency (MHz)	Signal Level Minimum	(mV rms) Maximum
.449	10	1,800
1.0	10	2,250
10.0	10	2,250
50.0	14	600
100.0	20	2,000
150.0	20	540
200.0	27	540
250.0	31.5	380
300.0	37	760
350.0	31.5	470
400.0	31	340
450.0	47	280
500.0	50	270
550.0	71	280

Resolution 1 kHz @ .1-second gate time; power requirements: 5 volts @ 200 mA or 7.5-24 volts @ 225 mA.

Table 2. Operating limits on the author's counter using an HP8640 for comparison.



PC board, component-side view.

cation notes for both the frequency counter and prescaler ICs.

I will not go into great detail on the operation of the two main ICs; the application notes have all of the necessary information. This counter will accurately measure frequencies from 500 kHz to over 600 MHz.

Operation

The frequency counter circuitry consists of three main sections. The first section consists of a wideband commercial-grade amplifier. The second section consists of two counters to prescale the signal down to a usable frequency since the Intersil maximum operating frequency is about 10 MHz. The third section is the Intersil counter which counts pulses for a specified gate time and then displays the frequency.

Preamplifier

The wideband amplifier has a flat frequency response up to 450 MHz and gradually starts rolling off as the frequency increases. The MWA130 has a gain of approximately 14 dB from 0 to 450 MHz and gradually drops down to 11 dB of gain at 600 MHz.

The high-power amplifier was chosen over the low-power version (MWA110) since the amplifier starts saturating at a much smaller signal level. When the amplifier starts saturating, the harmonics increase in amplitude relative to the fundamental. This confused the prescaler and resulted in erroneous readings. According to the data sheet, the prescaler is most sensitive with a 225-400-mV p-p signal applied to the input. The diodes on the input merely protect the amplifier since the diodes won't start limiting until a 500-mV p-p signal is applied. This signal level would result in presenting a minimum of 1-V p-p signal to the prescaler. This would limit the prescaler to only 450 MHz.

Prescaler

The 11C90 is a high-speed prescaler designed for communication and instrumentation applications. The prescaler can be programmed to divide by 10 or 11. The 11C90 is hard-wired in the divide-by-10 mode. The prescaler has both ECL and TTL outputs, but only the TTL output is used in this ap-

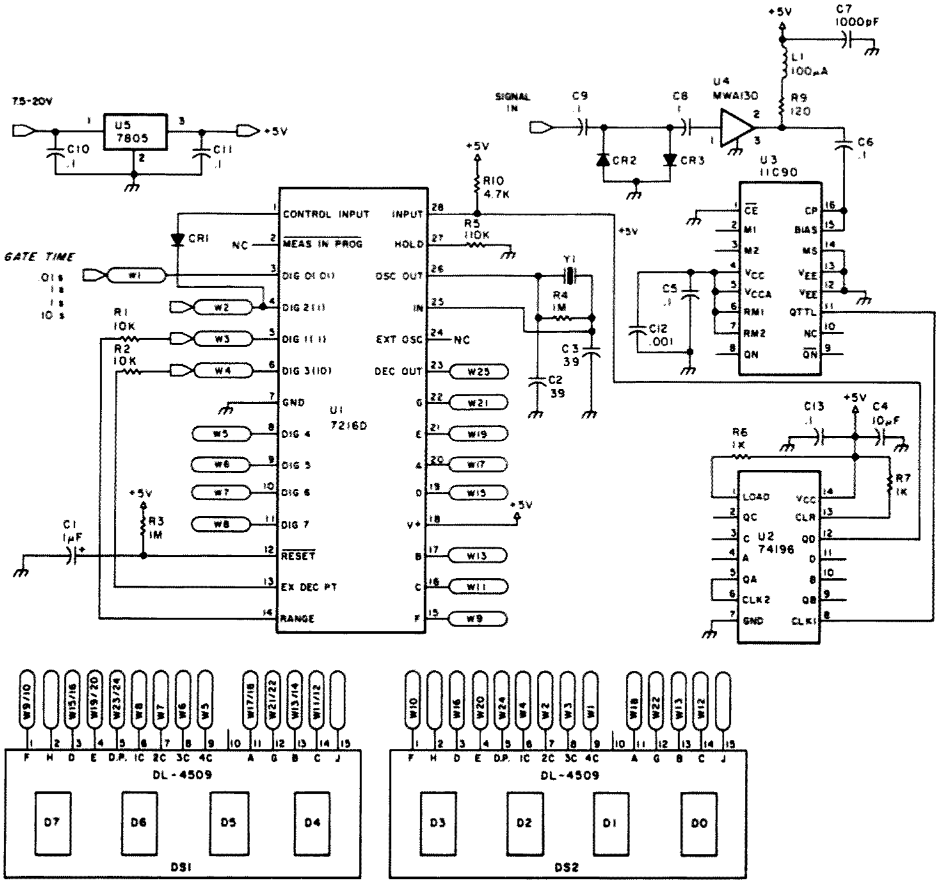


Fig. 2. Frequency counter schematic.

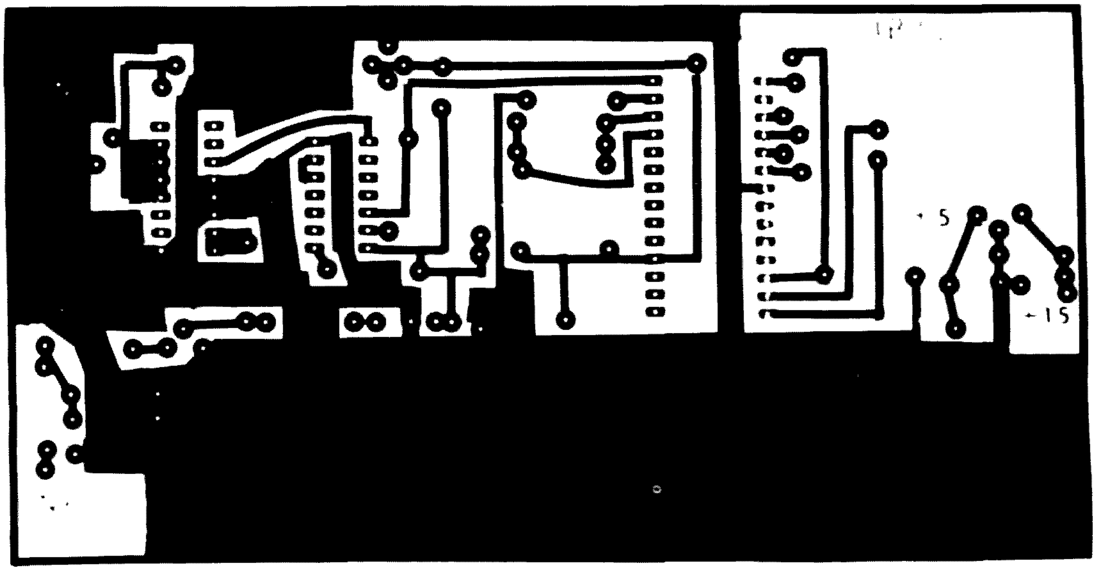


Fig. 3. PC board.

plication. According to the data sheet, this IC has the widest operating range, with a 225–400-mV p-p input signal level (see Fig. 1).

The prescaled output toggles a TTL decade counter; the output of the decade counter is now 1/100 of the original signal and is counted by the Intersil frequency counter.

Frequency Counter

The frequency counter has an internal time-base oscillator which uses an external crystal. A 10,000-MHz crystal was chosen for this application. There are a few discrete external components which tap the signals necessary for determining the counter's mode of operation. The counter has four possible gate times, but only the .1-second gate time is used, for simplicity. A 1-second gate time will increase the counter's resolution to 100 Hz, but will update the display at a much slower rate—which can be annoying if you are looking for rapid changes in frequency.

Construction

I laid out a printed circuit board for the circuitry and used the wire-wrap technique for wiring the displays. The point-to-point wiring method will work just as well for the displays. A wire list is included for wiring the two Litronix red multi-digit reflector arrays. These displays are very inexpensive, but almost any common-cathode, seven-segment displays can be used instead. The prescaler must be soldered directly onto the PC board, but DIP sockets can be used for the remaining DIP ICs. The builder should use the assembly drawing as a guide for installing the parts, and the parts list for determining the component values.

Parts List

U1	ICM7216D—Intersil (common cathode)[1,2]	$20.95
U2	74196	.80
U3	11C90—Fairchild [1,4]	16.95
U4	MWA130—Motorola [1,3,4]	8.25
U5	LM7805	.99
DS1	DL-4509—Litronix (common cathode)[2,4]	2.99
DS2	DL-4509—Litronix	2.99
Y1	10.0-MHz crystal	3.00
CR1-3	1N914 diode	10/.99
L1	100-uH-500-uH molded coil, ¼ Watt	1.35
Resistors (¼ Watt, 5% unless otherwise specified)		.07
R1,R2	10,000 Ohms	
R3,R4	1,000,000 Ohms	
R5	110,000 Ohms	
R6,R7,	1,000 Ohms	
R9	120 Ohms	
R10	4700 Ohms	
Capacitors		
C1	1 uF, 50 volts, electrolytic	.15
C2,C3	39 pF, mica	.28
C4	10 uF, 50 volts, electrolytic	.15
C5,C6,C8-C11,C13	.1 uF, ceramic disc	10/1.25
C7,C12	1000 pF, ceramic disc or mylar™	.12

Miscellaneous: PC board, 28-pin, wire-wrap IC socket, 14-pin low-profile IC socket, case, BNC connector, miniature phone jack, TO-220 heat sink, 8-digit bezel, wire, solder, etc.

1 Circuit Specialists Co., Box 3047, Scottsdale AZ 85257.
2 Jameco Electronics, 1355 Shoreway Rd., Belmont CA 94002.
3 MHz Electronics, 2111 W. Camelback Rd., Phoenix AZ 85015.
4 Semiconductor Surplus, 2822 N. 32nd St., Phoenix AZ 85008.

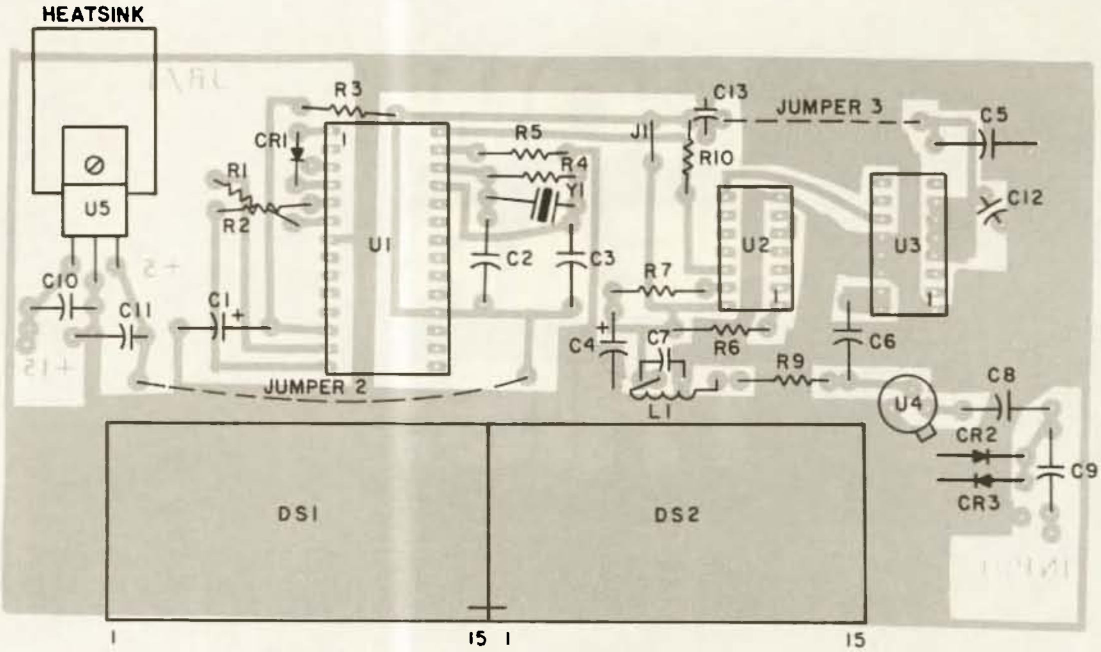


Fig. 4. Component layout.

Checkout

This project requires a +5-V-dc supply. A voltage regulator is supplied, so a dc charger (Radio Shack) can be used for power. When using the voltage regulator, the supply voltage can be anywhere between 7.5 and 20 volts but must be able to supply 200 mA of current. The display will light up as soon as power is supplied. Apply a signal to the input and the display will count the input frequency. You will be surprised at the excellent performance of the counter. ■

Evert Fruitman W7RXV
2808 West Rancho Drive
Phoenix AZ 85017

Don't Grope in the Dark!

Let a simple card-file box be the brains of your own emergency lighting system.

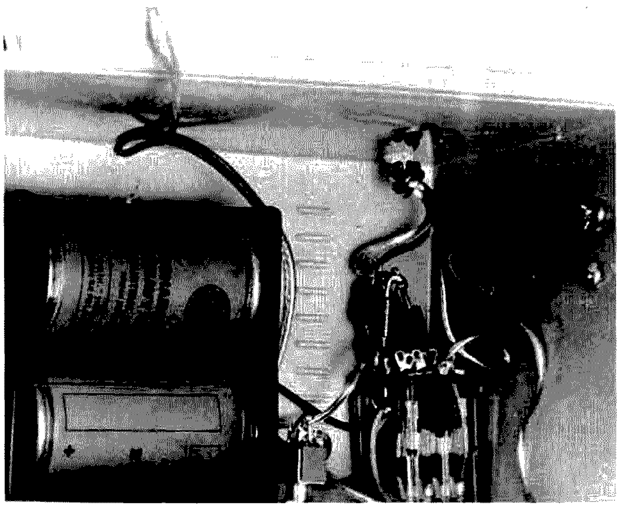
Because a salesman's business lunch was abruptly interrupted by a sudden power failure, a well-known flashlight and battery manufacturing firm was founded. When the main lighting system failed, everyone's attention was drawn to the restaurant's novel flower planters; they contained a crude flashlight. Perhaps this is one of the earliest recorded uses of automatic emergency lighting.

Today, it is common, even required in some cases, to have a form of automatic emergency lighting in hospitals, hotels, businesses, etc. Many homes are so equipped as a matter of convenience.

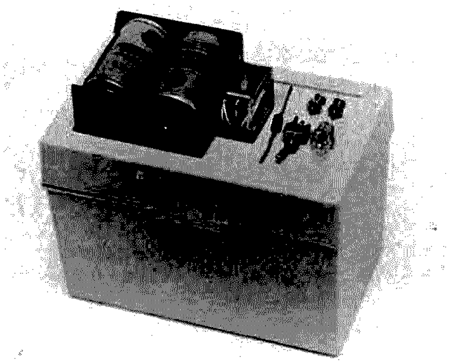
Although sophisticated commercial systems are available which include rechargeable batteries, trickle chargers, test buttons, and power-on indicators, it is practical to make a simple but very effective system mostly out of junk-box parts. The system need not be any more complicated than a flashlight lamp, two dry cells, a relay, and a snap-in battery holder. Two alkaline cells, if the TV ads are believable, should still give plenty of light even after two years of intermittent use, although an annual check/change might be in order.

Regardless of which system you put into your home, ham shack, or cabin, the basic operation is quite simple. When the power fails, the normally-closed contacts of a 115-volt relay complete the circuit between the batteries and light bulb. The bulb automatically turns off and the batteries start recharging (if it is that type of system) when the power is restored.

Gel cells take a float charge quite well, and for that reason are found in many commercial emergen-



Parts placement. The four diodes at the relay form a bridge, allowing use of a 6-volt relay and a cheap ac low-voltage game module. The diode near the top of the box ensures proper polarity of the recharging current.



The parts needed for the project.

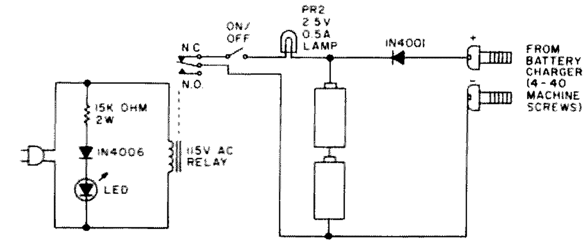


Fig. 1. Schematic of the emergency-lighting project.

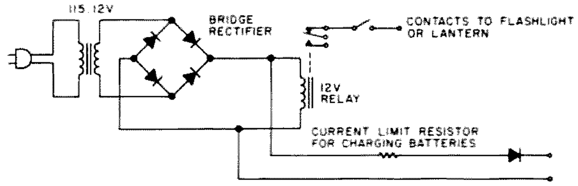
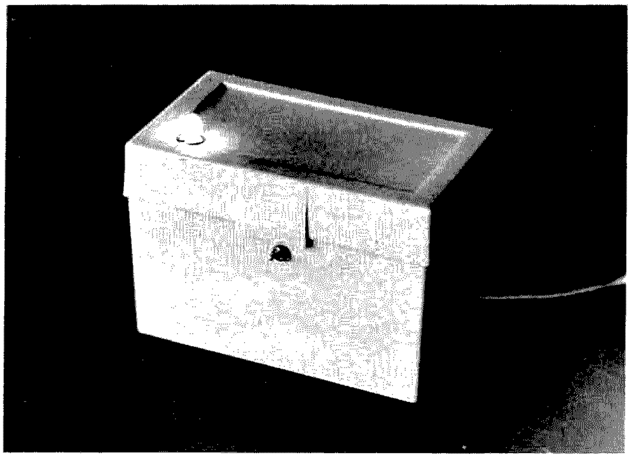


Fig. 2. A variation of the project.



The finished project in action.

cy-lighting systems. Nicads, on the other hand, don't like float charging and should be completely run down before being recharged.

A 4" × 6" card-file box holds the few parts I used. The on/off switch disables the system when it is purposely removed from the power mains. The terminals on the side of the box go to an external charger for the two nicads. As the diagram in Fig. 1 shows, a diode is series-connected with one of the terminals to prevent accidental discharge or reverse charge. The relay contacts could be connected to a lantern through a miniature plug and a closed-circuit jack if you don't wish to construct a flashlight. The relay isolates the 115-volt lines from the low-voltage lighting circuit.

Fig. 2 shows a variation using a low-voltage relay with suitable transformer and provisions for recharging batteries. Don't give up for lack of a 115-volt relay. Perhaps the spare-parts box has an old door bell transformer and a low-voltage relay in it, or a diode and a series-voltage-dropping resistor can make a dc relay work.

There are many possible variations of the basic circuit; this should give you a good starting point.

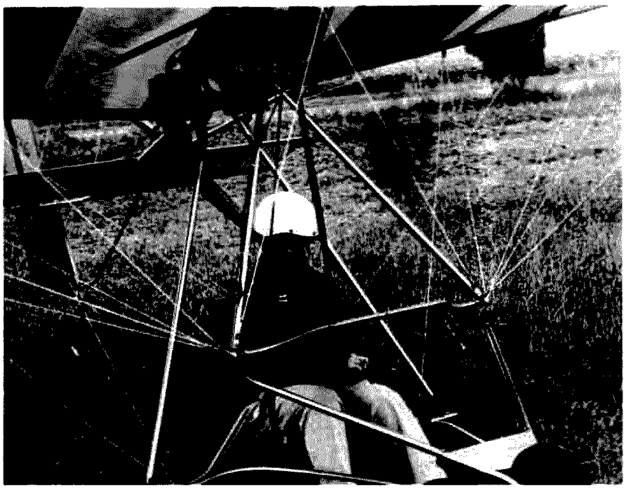
The gentle pitter-pat of a summer rain shower and accompanying sharp lightning bolt doesn't have to leave you in the dark again! ■

Flying High with Two

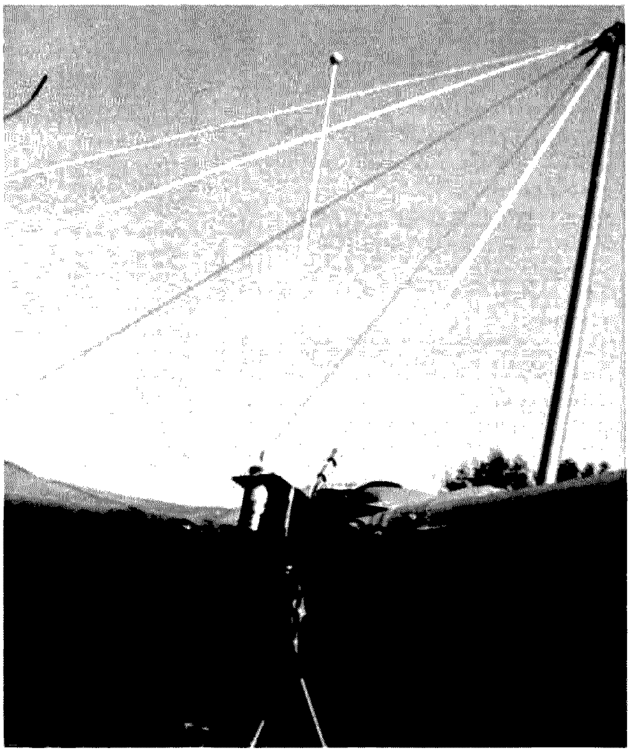
Here's how a hand-held makes for some ultralight Michigan madness.

Ralph E. Taggart WB8DQT
602 S. Jefferson
Mason MI 48854

FM articles in the amateur press seem to cover a wide spectrum—from providing communications for the opening of a new

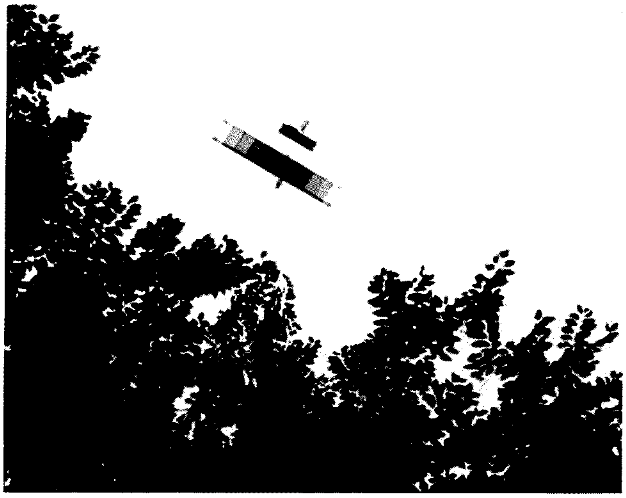


The author intently strapping into the flying harness prior to donning stopwatch, camera, and hand-held. Some of the wire bracing that rigidifies the aircraft structure is clearly visible. The 15-hp engine is mounted below the wing and drives the prop (located behind the wing) through a belt reduction system.



A 2-meter quarter-wave whip anchored to the forward end of the fuselage provides increased range over a rubber duckie partially shielded by the tubular frame of the aircraft.

Don Chubb, my partner in ultralight madness, lifts off in light ground fog for an early morning flight. The pilot's weight is shifted to the rear for takeoff and climb, achieved by simply keeping his legs straight when his feet are resting on the foot bar up by the nose wheel. Movement forward will pitch the nose down while movements from side to side will turn the aircraft in the direction of movement. Pitch control is achieved entirely by weight shift. The side to side movements of the pilot induce the required bank for a turn with the rudder coupled to the harness. Although such a control system sounds strange to a pilot used to the conventional control stick and rudder pedals, it actually feels quite natural and can be learned in a fraction of the time required for conventional flight training.



After taking off and making a 180° turn, the author swings back over the farmyard while climbing to cruise altitude. Although our Quicksilver has a service ceiling of 9000 feet, most flying is done between 500 and 1500 feet—high enough for safety yet low enough to avoid most other air traffic while still maintaining a good view of the countryside. Wind is the greatest enemy of the ultralight flier and most flying is done with wind speeds of 5 mph and below—primarily early morning and early evening. I have built a couple of fancy anemometers to keep track of wind speed, but the leaves of this old tree still provide the most reliable indication of flying conditions.

sewage plant to linking voice-controlled repeaters with blue light. In a sense this is an FM article, but it is a bit off the beaten track in that it describes a new use for those ever-present two-meter hand-helds that seem to be sprouting up like mushrooms on the ad pages of all the magazines.

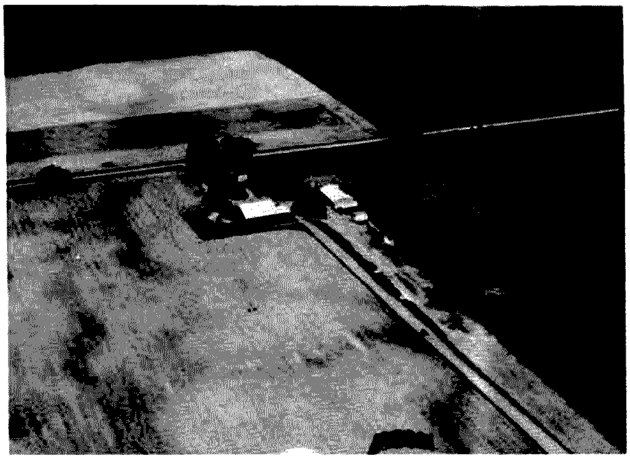
The subject at hand is the marriage of good old VHF and UHF FM with what is perhaps the neatest invention since 20 meters—the ultralight aircraft. It is an application where your FM bands may provide one of the few viable options for good communications (more on that later), but for the moment, if you have a slightly adventurous spirit, hang in there and let me introduce you to ultralights prior to lamenting their communications problem.

First of all, what is an ultralight? The easiest answer is that it is a minimal aircraft—a simple flying machine of aluminum tubing, dacron™, and a small engine—that can introduce you to the thrill of flying with a minimum of fuss, low cost, and, although it might seem difficult to believe, safety. Almost everyone has dreamed of flying at one time or another and radio amateurs are at least as prone to the syndrome as anyone else—perhaps more so. The next time an air mobile calls on 52, just listen to the pileup! The response is due in no small part to the vicarious participation it provides.

In the days of the Wrights and pioneers such as Glen Curtis, the aircraft were constructed of wood, fabric, and wire, and although the activity was far from safe, it was thrilling enough to galvanize a world into the age of flight. Today flying is taken for granted—the thrill is still there and it is certainly safe, but just as certainly it is no longer either simple or economical. Of course it really can't be simple with air lanes crisscrossing the sky stacked all the way to the stratosphere and the requirement of maintaining the safety of those in the air and on the ground. Nonetheless, it is hard to avoid nostalgia for the early days when frail aircraft lifted out of cow pastures, thrilling pilot and spectators alike.

In a sense, ultralight aircraft can provide a return to the best of these rose-colored visions. Ultralights trace their evolution to the hang-gliding movements of the early and middle 60s when intrepid souls, longing to fly on a budget, launched down hills and sand dunes on (or more precisely beneath) rogallos, monoplanes, and biplanes constructed of bamboo and plastic sheeting. That sport blossomed with the aircraft rapidly evolving to sophisticated aerodynamic forms constructed of aircraft aluminum and dacron. Today the sport is dominated by launches from cliffs and mountains in search of the lift to provide flights to extreme altitude or long distances cross-country. Internal regulation permitted hang gliding to develop into a generally sane activity and I have followed its development for several years.

Unfortunately, Michigan has no mountains and even if we had spectacular cliffs and sea breezes, I really couldn't see myself stepping off into the void! Apparently other flatlanders had the same problems, but their response was different. Instead of sighing and putting away the magazines, they responded by attaching engines and wheels to reliable hang-glider designs and ultralights were born! The result has been a



Our rural "aerodrome" photographed from an altitude of 400–500 feet. Not a bad antenna location. Although the gain of the array may not be spectacular, it's hard to complain about the line losses. The reliable communications range is quite fantastic and if the link is marginal, you simply climb a little higher.

surge of reliable, simple aircraft that will fly out of your local pasture. Aircraft-grade aluminum tubing and hardware, stabilized dacron, and light and powerful two-cycle engines replace the hardware of yesteryear while sophisticated application of low-speed aerodynamic principles replaces the "wonder if this will fly" approach of the early days. The simplicity and thrill remain.

At present, regulation is minimal (no pilot certificate or aircraft registration required) if the design meets two criteria—it must carry only one person and it must be *capable* of being launched and landed on foot. Note that I said capable. If the ultralight is a commercial product, the manufacturer will provide evidence of foot-launch and -landing capability and you can stick to your wheels. However, if you designed the bird or modified it and you should encounter an FAA inspector, expect to demonstrate it yourself. If you fail to do so, you will be advised to get a student pilot's certificate and register the aircraft. Stricter regulation is on the horizon, but it will probably be modest with an aim toward maintaining safety while preserving a category for simple recreational aircraft. Present limitations will probably be retained with the addition of standards for maximum aircraft weight, flight training standards, and assurance of familiarity with the Federal Aviation Regulations (FARs).

Ultralights come in a bewildering array of designs, most running between $3000 and $4500 in price. Most ultralights are delivered in the form of a collection of aircraft hardware, pre-drilled and -formed aluminum tubing, and presewn fabric with assembly time varying from 10 to 30 hours.

The key to safety is to stick with those manufacturers who insist that you buy from a dealer who will inspect your work before you fly it. The *Quicksilver*, owned by my partner Don Chubb and me, is a good example of this policy. Manufactured by Eipper Formance of San Marcos CA, it must be purchased through a dealer who will provide any advice you require during assembly (about 20 hours). The dealer will withhold certain vital items—such as the prop—pending dealer inspection of your machine and will test-fly it once assembly is complete. You cannot take full possession of your flying machine until you have completed the dealer flight training course which involves about 5 hours of instruction. One or two hours will get you to your solo while the rest is devoted to developing proficiency.

The plane itself is very simple to fly and after the first few minutes of your solo you will ease out of the shaking-knees-and-white-knuckle phase and really relax and enjoy the experience. The key to safe ultralight flight is rigorous preflight checks on the machine and careful attention to the wind. The latter is an important factor given the light weight of the machine. Our *Quicksilver* has a 32-foot span and 160 square feet of wing area yet weighs only 155 pounds. With a pilot weight of 190 pounds, that is quite a bit of wing for relatively little weight. Most training is conducted under calm conditions. Air currents of 5–10 mph are considered windy and gusty conditions are avoided completely.

The thrill of flying cannot really be described. To really understand it, you have to experience the world opening up as you rise above the tree line at the start of your own private dawn patrol over the rural countryside. Suffice it to say that I spent a good bit of the summer flying every minute I could with nary a thought to the old radio shack!

Once I had become immersed in the ultralight experience, however, I did begin to realize that communications between the pilot and the ground could be of real value. Take training as one example. Needless to say, there is no such thing as dual instruction in a single-seat ultralight. The instructor stands on the sidelines to discuss your progress and problems as you learn proper ground handling, transition to crow hops (short hops into the air down the runway), and finally the solo flight.

Ultralights fly very slowly (typically 20–35 miles/hour) and are constructed of tough materials so you are not likely to hurt yourself in training. However, it is possible to bend some tubing that will cost $$$ to replace. Most of the student problems leading to bent tubing and a confidence crisis could easily be avoided if the instructor could speak to the student during his gyrations instead of afterward. Sounds like a job for radio. Ditto once you are flying regularly. Wind conditions can change, for example, while a flight is in progress. It would be nice if the individual waiting patiently (?) on the ground for his turn could talk with the flier about such weighty matters—not to mention the inevitable "You've been up for 40 minutes, the sun is going down, and I want my turn!"

Cross-country flights have their own attraction; although you will not go particularly far cruising at 30–35 mph, flights of up to 30 miles are quite practical. We usually run a chase car for such ventures, but the car has to follow the roads and is often detoured to pick up gas for the return flight or to get the family outdoors to watch Daddy fly over. Given these realities, a communications link would be quite useful in keeping track of where the aircraft is located, notifying if the flight route has been changed, or, heaven forbid, if you have had to put down somewhere out in the boonies with a problem.

Most ultralights are flown without instruments since they really aren't needed for this kind of flying. If you do carry up an altimeter or air-speed indica-

tor, it is usually out of a sense of curiosity rather than necessity. Radios, however, would be nice. The question is, what kind of a radio. It is here that the unique nature of ultralights presents a problem. Most are powered by two-cycle engines and the pilot environment is noisy, to put it very mildly. The noise is both acoustic and electrical. The former is taken care of by ear plugs designed to deaden impulse-type sound waves, but the electrical dimension is pure poison for an operating radio system. The electrical noise level varies with the engine in use but typically is moderate to quite high.

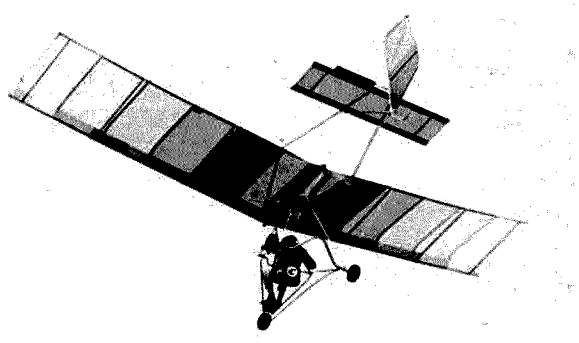
When an ultralight pilot or instructor first thinks about radios, the first step is usually a CB hand-held. Such units lack internal noise limiters and have poor squelch action and cumbersome antenna systems. The newer "rubber duckies" for 27 MHz have eased the size problem somewhat, but they are poor performers at such a low frequency. Even with a 5-Watt ground-based unit, the end result is a radio system that is so noisy and unreliable that it hardly pays to take it up!

Very compact transceivers (even synthesized hand-helds) are now available for aircraft service (108-136 MHz), but these are AM and have many of the same operational limitations as CB units. They also tend to be very expensive. But what about FM? FM would solve the electrical noise problem to a large extent and is characterized by effective squelch action as well. Since I already had a synthesized mobile rig for two meters, this was a logical place to start. Off to look at hand-helds!

I am definitely not a two-meter freak, so the rig for the plane did not have to be microprocessor-equipped —I was not, after all, going to figure my income tax while aloft. I started to scrounge for an old-fashioned crystal-controlled hand-held since these are now considered passé in the better FM circles. A close-out deal of a Pace Communicator MX, complete with rubber duckie, nicads, and charger, seemed the best bet, so off went a phone order to AES in Milwaukee and I had the unit a few days later. A quick check with the wattmeter indicated that my 1-Watt transceiver was putting out 700 mW in the high power mode and about 200 mW in low. What the heck, this did not seem to be an application requiring excessive power and the batteries would last longer. A camera strap was clipped to the securing ring on the hand-held; it went over my shoulder and I headed for the wild blue yonder.

The results of the first test were mixed. On the plus side it soon became obvious that even 200 mW was sufficient for solid communications to the ground mobile, with altitude more than compensating for the inefficiencies of that rubber excuse for an antenna. Although the noise of the engine was definitely modulating the downlink signal, the voice audio had no trouble riding over it with adequate intelligibility. Reception upstairs was another matter, however. Between the engine noise and the ear plugs, there was no way that that little speaker was going to be heard.

That evening was spent on the bench adding an earphone jack. The next morning, complete with an earphone, we had a working communications system. My partner was impressed enough by the tests that he is hitting the code tapes and books to join the party. Refinements now under way include a padded clamp-rack for the radio, a quarter-wave whip mounted above the wing, and a "radio helmet" with a pair of built-in padded phones and a boom mike. Included will be a remote PTT switch on the control bar to minimize the one-handed flying.



The author photographed during a landing approach. Landings are typically made at low throttle with pilot weight shifted well forward to keep the nose down and the airspeed up. Note the bent knees to achieve this attitude.

Although the system was put together for utility communications, it soon became obvious that it had great potential for recreational hamming. Take my word for it: If you give a call on 52 from 1500 feet, you will get answered. It's really fun when the crowd discovers what you are flying and starts preparing the commitment papers while you are still aloft. The crystal complement includes 52 for general hamming, an out of the way frequency for utility communications (never mind where), and a couple of wide-coverage repeaters for the day I have to set down in someone's back 40 and call in the cavalry.

Obviously, if you are an amateur interested in ultralights, you have the communications problem half licked. Although all tests to date have been on two, 50, 220, and 440 MHz would be equally useful although lower-band occupancy might reduce the recreational potential.

A real interesting feature is the potential for recruiting ultralight types to ham radio. Most tend to be highly interesting people and we certainly can't complain if we snag a few of those to swell our ranks. Most fliers would like reliable radio systems and amateur radio can provide just that with a little study. An instructor with a ham ticket need only equip students with a pocket scanner to be able to provide those much-needed instructions at panic time. The advantages are obvious and the canny amateur will work a deal exchanging code and theory tutoring for flight instruction.

One of the things that keeps our hobby healthy is the constant search for new modes as well as new applications for existing technology. There will certainly be lots of ultralight fliers out there—the industry delivered only a few thousand units in 1980, but '81 sales soared quite a ways past 10,000 and most people are still unaware of their existence. Who knows, air mobiles might become quite common. As for me, try 52 and please excuse the background noise—I only worry when it stops! ■

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Creason's Do-It DVM

The more Sam builds, the more smart people pay attention.

One of the handier pieces of test equipment for someone who experiments with solid-state analog and digital equipment is a hand-held DVM. I recently needed such a device to measure dc and rf voltages. Since I had no need for either ac or Ohms scales, I chose to save a few dollars by building my own. A schematic of the result is shown in Fig. 1.

The heart of the DVM is an Intersil ICL7106 3-1/2-digit single-chip analog-to-digital converter (ADC) with on-board liquid-crystal-display (LCD) drivers. Powered by a 9-volt battery in the manufacturer's recommended circuit, it provides a basic 0.1999-volt full-scale DVM. Additional components expand the voltage measurement capability and drive the decimal points of the LCD.

The components which are grouped at the upper left of the 7106 (pins 27–29, 38–40) support internal functions: an oscillator, reference generator, auto-zero circuit, and integrator. The interested reader should consult a data sheet on the 7106 to learn more about its internal workings.

The components which are grouped at the lower left of the 7106 (pins 1, 26, 30–32, 35, and 36) provide power, a reference voltage, and the means to connect the voltage to be measured. Switched 9-volt power is applied between V+ and V−. The 22k fixed resistor and 1k trimpot which are connected from V+ to REF LO generate a reference voltage for the converter. The reference is stable because REF LO and COMMON are tied together, and COMMON is internally clamped at about 2.8 volts below V+. The voltage to be measured (0.1999 volts maximum) is applied between IN HI and IN LO (the latter and COMMON are tied together). A 1-megohm resistor limits the current which can flow in response to an overvoltage. Together, the 1-megohm resistor and a 0.01-uF capacitor form a simple low-pass filter. Taps on the 10-megohm resistive ladder between +IN and −IN provide 1.999-volt, 19.99-volt, and 199.9-volt ranges, selected by switch S1a.

With the exception of pin 37, the remaining pins on the 7106 drive the LCD directly. Unlike an LED display, an LCD must be driven by ac waveforms. A dc drive voltage will burn out an LCD in a matter of minutes. The 7106 applies a 60-Hz 5-volt peak-to-peak square wave to the backplane of the LCD. As long as the same waveform

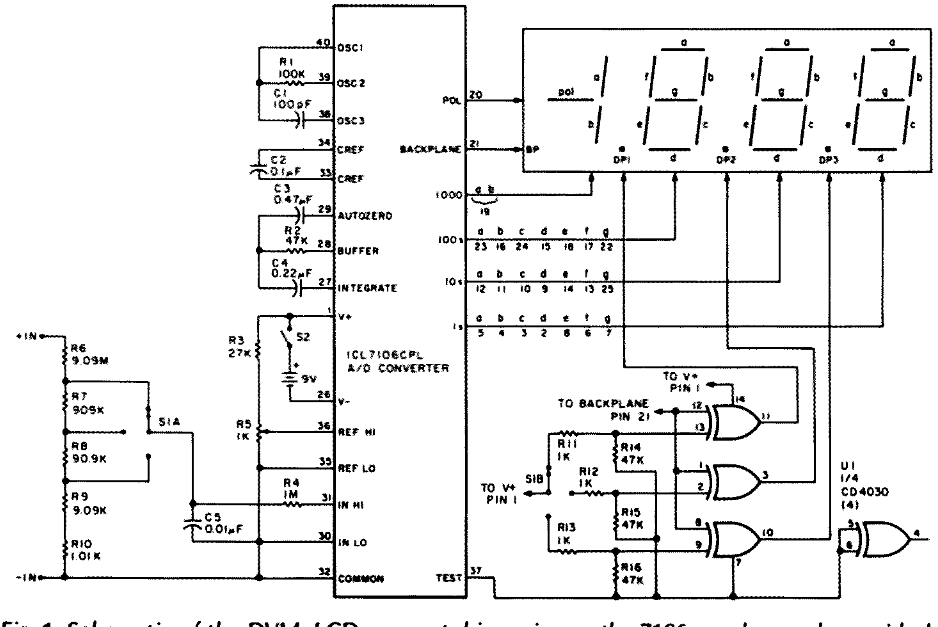

Fig. 1. Schematic of the DVM. LCD segment-driver pins on the 7106 are shown along with the designations of the segments which they drive. No pinouts are shown for the LCD, since they vary from device to device. Undesignated resistors are ¼-Watt, 5% tolerance. R5 is a 10%-tolerance trimmer. R6 through R10 are ¼-Watt, 1% tolerance. R6 is a 90.9k and nine 1M resistors in series. R10 is a 1k and a 10-Ohm resistor in series. Undesignated capacitors are mylar™. C1 is mica. All capacitors are 10% tolerance, 100-volt.

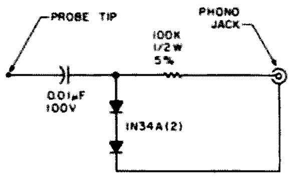

Fig. 2. Schematic of the rf probe.

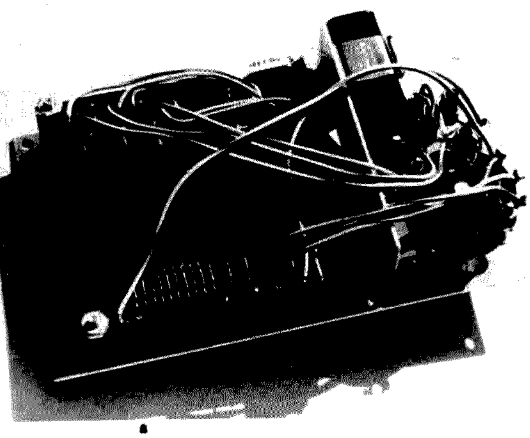

Photo A. Internal construction of the DVM.

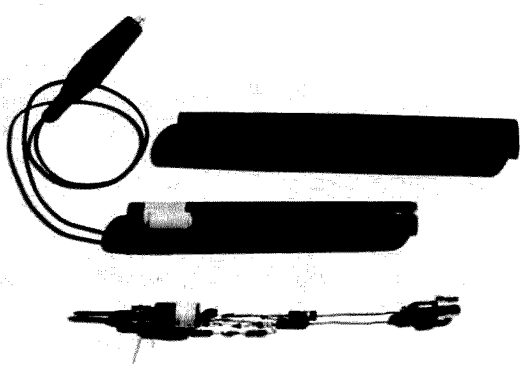

Photo B. Some construction details of the rf probe.

is applied to a segment of the LCD, that segment is off. A segment is on when the waveform applied to it is inverted with respect to the waveform applied to the backplane. The 7106 has internal drivers which accomplish the inversion for the minus sign and each segment of each of the four digits.

The circuit which consists of the CD4030 quad exclusive OR gate, S1b, and six resistors is needed in order to drive the decimal points. One input of each of the three active EOR gates is connected to the backplane drive signal. Depending upon the setting of S1b, the second inputs of two of the active EOR gates are pulled low by 47k resistors tied to ground (pin 37, TEST, is digital ground). These two gates pass the backplane drive signal unchanged, and the corresponding decimal points are off. The second input of the remaining active EOR gate is pulled high via S1b and a 1k resistor tied to V+. This gate inverts the backplane drive signal, and the corresponding decimal point is on.

With the possible exception of the LCD, all parts for the DVM are available from the usual mail-order houses. Also available is an evaluation kit which contains a 7106, an LCD, the passive components to build the bare-bones 0.1999-volt full-scale DVM, and a printed circuit board. The components for the input-voltage divider and decimal-point circuit and the rotary switch and toggle switch must be obtained separately. I used a kit for the convenience of the PC board. However, buying the individual components and assembling them on a piece of perfboard will cut the cost significantly.

Photo A shows the internal construction of the DVM. About ½" of the PC board which is supplied in the evaluation kit is cut away. The cut is made at the upper edge of the pads which accommodate the input jacks. A 1" strip is then cut from the bottom of what remains of the PC board and reconnected at an angle of 90 degrees. Lengths of no. 20 wire restore the connections and provide mechanical support for the strip.

All capacitors except the mica device are mounted on the rear of the board. A piece of perfboard containing the resistive ladder for the input circuit and the decimal-point driver circuit is mounted 1/4" behind the PC board, on fiber spacers. The PC board is mounted 3/8" behind the front panel by means of additional fiber spacers. The entire assembly is held together by 6-32 hardware. The enclosure measures 6-1/4" long by 3-3/4" wide by 2" deep and is of unknown brand. A similar-size mini-box would be a suitable substitute. If a larger enclosure is acceptable, the PC board may be left intact.

Fig. 2 is a schematic of the rf probe, which consists of a resistor, two diodes in series, and a disc-ceramic capacitor. The measured value of an rf waveform corresponds well to the value indicated on the DVM when a 100k resistor is used. A 4.7-megohm resistor might seem the correct choice, given the 10-megohm input impedance of the DVM. However, the ADC is an integrating device which will directly give the rms value of the rectified waveform. Two diodes are used in series to allow measuring rf voltages as high as 30–40 volts.

Photo B shows some construction details of the rf probe. The capacitor is just behind the body of the probe tip, a Radio Shack 274-723 solderless probe tip which is cut to 1-3/4" overall. The component assembly measures 4" from the center of the large portion of the phono plug to the opposite end of the probe tip. The shield for the probe is a 4" length of 3/8"-i.d. copper tubing. The lead from the ground clip is soldered into a notch at the end of the tubing. Taping a 1" "U" into

Parts List for Rf Probe

Part	Value	Part number	Cost
C1	0.01 uF, 50 volt	DC.01/50(J)	.08
D1, D2	1N34A	276-1123(R)	.10
J1		274-346(R)	.45
Alligator clip		270-378(R)	.13
Heat-shrink tubing		278-1627(R)	.50
Phone tip		274-723(R)	.50
Copper tubing (local hardware store)			.50

Parts List for Dc Probe

Part	Part number	Cost
Coiled test leads	278-750(R)	3.99

Vendors For Parts

For part numbers marked (R):
Radio Shack—local
For part numbers marked (J):
Jameco Electronics
1355 Shoreway Road
Belmont CA 94002
(Minimum order $10.00)
For part numbers marked (E):
Electronic Supply Co.
2486 3rd Street
Riverside CA 92507
(minimum order $5.00)
or
Digi-Key Corp.
PO Box 677
Thief River Falls MN 56701

Parts not in Evaluation Kit

Part	Value	Part number	Cost
R6	9.09 meg	1M(E)	4.50
		90.9K(E)*	.50
R7	909k	909K(E)	.50
R8	90.9k	90.9K(E)	.50
R9	9.09k	9.09K(E)	.50
R10	1.01k	1K(E)	.50
		10 Ohms (E)**	.50
R11-R13	1k	271-1321(R)	.06
R14-R16	47k	271-1342(R)	.06
Battery connector		– (J)	.10
Case		270-627(R)	2.39
Battery, 9-volt		23-464(R)	.59
S1, 2-pole, 3-position		275-1386(R)	1.19
S2, SPST		275-612(R)	1.69
Knob		274-415(R)	.40
14-pin DIP socket		– (J)	.17
Hookup wire, #22 stranded		278-1307(R)	2.19

* 90.9k and nine 1M in series; $4.50 is cost of nine resistors.
**1k and 10 Ohms in series.
For R6 through R10, prefix part number with TRW/IRC-RN55D.

Substitutes for Parts in Evaluation Kit

Part	Value	Part number	Cost
R1	100k	271-1347(R)	.06
R2	47k	271-1342(R)	.06
R3	27k	271-1340(R)	.06
R4	1 meg	271-1356(R)	.06
R5	1k, variable	43P-1K(J)	1.19
C1	100 pF	DM15-101J(J)	.35
C2	0.1	MY.1/100(J)	.27
C3	0.47	MY.47/100(J)	.45
C4	0.22	MY.22/100(J)	.33
C5	0.01	MY.01/100(J)	.12
Perfboard		84P44WE(J)	2.95
A/D converter/driver		ICL7106CPL(J)	9.95
Banana jacks (2)		274-725(R)	.69
Battery holder		270-326(R)	.30
40-pin DIP sockets		– (J)	.49
3½-digit LCD			

Unless otherwise shown, resistors are ¼ W, 5%, carbon. 100-pF capacitor is dipped mica; others are mylar™, 100 V, with values in microfarads. Cut one 40-pin socket in half, lengthwise, to accommodate width of display. Evaluation kit 7106EV/Kit may be obtained from Jameco Electronics for $34.95.

the lead avoids stressing the solder joint.

The first step in assembling the probe is to tape the exposed leads. Then the component assembly is slipped into the copper tubing so that the free lead from the 1N34A lies on the solder joint of the lead from the ground clip. The phono jack is soldered in two or three places. When the tubing has cooled, the free end of the diode is quickly soldered into the notch. Finally, a piece of heat-shrink tubing is used to cover the tubing. The cable for the probe consists of a piece of RG-174 coax with a phono plug at one end and a pair of banana plugs at the other.

Once the DVM is built, calibration is simple. Select the appropriate range and connect a known dc-voltage source. Adjust R1 until the correct value is displayed. A new 1.5-volt battery is a convenient source. ■

Leon Fletcher N6HYK
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Meeting Ends Make

These ten tips will better your club. Are you friendly or frigid?

Recently, a ham I know moved to an area which has two ham clubs. *"And they're both mighty big bombs!"* he told me.

I asked him what he meant.

"I went by myself to the club meetings—they were on different nights, of course. When I arrived, at both clubs, there were about 20 members already there, shooting the breeze in small groups. *Man, were they unfriendly!"*

But, of all the problems hams face, are unfriendly clubs worth worrying about?

If you need statistics, the answer is that no one knows. While there are more than 2,600 amateur-radio clubs in the United States, no one keeps score of just how many could be rated "unfriendly."

But if you ask—as I have—a number of hams who move often or who travel frequently and visit local clubs, you, too, may be surprised at just how widespread the problem seems to be.

Ask, for example, hams who belong to such clubs as the Naval Postgraduate School Amateur Radio Club in Monterey, California Most of the members are service personnel who move to new duty stations every couple of years or so, joining new clubs across the country and abroad. Several members of the Monterey club have told me of their firsthand experiences about just how friendly or unfriendly some clubs are.

Yet it's a problem that's hard to pinpoint.

Many hams are reluctant—understandably—to name clubs or even cities in which they feel clubs are unfriendly. As one unhappy member put it, "No use me mentioning names and making them still more unfriendly!"

Yet every example and quote in this report came from hams who have faced frigid receptions at various ham clubs.

Another reason the problem of unfriendly clubs is hard to pinpoint is that what makes a club seem unfriendly to one ham may lead another to consider that club as desirable. One newcomer told me, "When I went to my first meeting at this one club, no one even asked me if I wanted to join." But another ham said, "I don't like clubs which try to push you into joining the first time you come."

Still, in spite of such conflicting views and the lack of data on how many clubs could be rated "unfriendly," there are enough hams telling horror stories about unfriendly clubs to suggest it might be wise for all ham clubs—and their members—to take a careful look at themselves, to make sure they do in fact make newcomers feel welcome.

From listening to hams who belong to a variety of amateur-radio clubs in different cities, I've identified ten tips on how to make and keep your club "neighborly," to use the word of a young ham from Iowa I talked with recently.

The first tip came from an experience told to me by a ham on the day after his first visit to a club.

"I walked in at 7:25 pm, five minutes before the meeting was to start. A couple dozen members were already there. A few of them were talking to someone next to them. The rest were silent—just sitting there, not saying a word. Only a few glanced at me as I stood at the door, trying to figure out where to sit. No one invited me in. Not a one said anything to me or even gave me a nod."

Tip #1: Ham clubs should designate two or so of their members to be greeters, to welcome newcomers.

Greeters don't have to be—shouldn't be—formal. They don't have to stand at the door, wear neckties and jackets, have a set patter, escort newcomers during the entire meeting, or such. Instead, greeters should simply keep an eye on the clubroom door as they mix with other members; when they see an unfamiliar face, they

should go over immediately, introduce themselves, and initiate the usual ham talk. Such face-to-face meetings need not be much more structured than the usual on-the-air QSO.

Once the greeter has learned a few of the special interests of the newcomer, he or she should introduce the guest to another member with similar interests. The point is, of course, to make sure first-time visitors are not left on their own to search out members with whom they may feel comfortable.

To prod my friend to tell me more about that club which ignored him as he walked in to its meeting, I asked, "So what did you do?"

"There were just three empty chairs. They were all together, at the far end of the table. I walked down to them. No one asked me to sit or anything. I waited a few seconds and then sat down. The guy next to me gave me a glance and then went on with his small talk to the ham across the table."

I prodded again: "Not very friendly, huh?"

"After waiting what I thought was a proper length of time for a break in the chatter, I introduced myself to the two guys. One said 'Hi,' gave me his call, and went on with his talk about the weather or something."

Tip #2: All club members should be urged to talk with newcomers.

This is so basic it's almost embarrassing to mention. But of course the problem is *not* that hams are socially unsophisticated, not knowing that they should talk to others. Rather, many of us get so involved in our own discussions of hamming that we may ignore others.

Hams, like many people everywhere, can benefit from increasing their sensitivity to the interests and needs of others, especially to newcomers. That will not only make recent arrivals feel welcome, but also it will help you feel better. As American humorist Philander Johnson wrote, "New friends leave the heart aglow."

My friend's concern about unfriendly ham clubs sounded deep, so I urged him on: "Meet anyone later in the meeting?"

"The meeting started out with the usual self-introductions. You know, they went around the room, each ham giving his or her name and call. When it came my turn, I said just what the others had—my name and call—adding that I'd just moved into the area."

"Did that spark any interest?"

"Not a bit. The self-introductions continued."

Tip #3: Make all introductions worthwhile.

Many clubs open meetings with self-introductions which are given quickly and briefly; many are muttered, some are embellished with bits of "in" humor, getting laughs from only a few. Such self-introductions become so routine they are close to meaningless.

I asked several long-time members of various clubs, "What good are those introductions?" Answers were limited.

"Gets members participating." (Saying just three or so words equals participation?)

"We get to know who's here." (To find that out, most members have already looked around long before the self-introductions.)

"Lets everyone have a moment in the spotlight." (Hams, with all their distinctive skills and achievements, need that?)

Introductions should not take much time of a meeting, but they should be valuable. Members should be encouraged to speak slowly, clearly, and add a few words about their recent activities, interests, or such. Setting a limit is wise—the membership guide for one group states, "No more than 20 words."

One good technique for improving introductions was suggested by Gene Piety KH6PP, now living in Santa Cruz, California:

Tip #4: Have a greeter introduce newcomers.

Only a few words are needed: "Here's a ham new to our area, interested in home-brewed rigs. He's just moved here from (. . .). His name is (. . .); his call is (. . .)."

An interesting technique to add friendliness to clubs was initiated by Bill Webb NK6H, of Monterey, California, when he was president of his local ham club:

Tip #5: At each club meeting, have one or two members give, say, a 5-minute autobiography, preferably with slides, artifacts, or such, detailing their shack and their interests beyond hamming.

These, of course, should not be formal speeches. Brevity is the key.

There is the problem that some members may be hesitant to give such talks. Perhaps they overlook the fact that when they're A3-ing, there may well be far more people listening than are at their club meetings. So start by asking those members who seem to like to get up and speak. Also ask frequently for volunteers — that apparently shy one may well be masking a stimulating speaker! After a few members have presented themselves, most of the others will usually want to take part, too. Certainly some may be strictly against getting up to give such talks, but there's no need to pressure them into participating.

Another idea to help clubs welcome newcomers came from this story told by a ham in central California—that's as close as he wanted to identify this club.

"After my first meeting, when I got home, I realized I really hadn't learned much about the club. Sure, I heard the treasurer's report—they had several hundred dollars in the till. But since they didn't say what activities they're into, I couldn't tell if they had money or not. The president said the newsletter gave details about an upcoming field day, but I didn't see a copy—they were mailed to the members' homes. And I met a couple of guys, but too fast for me to remember all their names and calls."

Tip #6: Give information packets to newcomers.

The packets should include, at the very least:

1. List of members with their calls, addresses, and phone numbers.
2. List of committees—members and tasks.
3. Minutes of the last few meetings.
4. Copies of recent newsletters.
5. Schedule of activities.
6. Repeater frequencies for the area.
7. A copy of the club's constitution.
8. Instructions on joining.

Other materials some organizations give to new members—although I know of no ham clubs which provide these—include:

1. Local sources for equipment, parts, services, etc.
2. List of names of members' spouses and children (helps develop family involvement).
3. History of the club.
4. A few copies of articles about the club — say the top three articles published in the last year or so.

Here's the experience of another ham. It's valuable because it points to another tip to help ensure that visitors don't come to just one of your club's meetings and then never show up again.

"The club's secretary gave me an application form for joining the club. I

thought that was a nice touch. Later, I read the application. It included a statement I was to sign, agreeing to abide by all provisions of the club's constitution. That seemed overly formal, but I figured, well, maybe they have a good reason for that provision. Only they hadn't given me a copy of the constitution. And when I asked for a copy, I was told it was being revised and would be ready in a month or so, but not to worry, just go ahead and sign anyway."

Tip #7: Give newcomers a copy of the constitution, rules, by-laws, or whatever guides your club.

Even if your constitution, for example, is being revised, prospective members should be given a copy of it so they'll know the ground rules as they are at the moment. Many prospective members consider such documents quite seriously. They like to know what they're getting into—how decisions are made, dues increased, leaders selected, and such. They *don't* agree with the advice of American writer George Ade: "To ensure peace of mind, ignore the rules and regulations."

An officer of one ham club I visited handed me an application form on which two members were to sign as "sponsors" of new members. But since I didn't know anyone in the club and since neither that club officer nor that form told me how to get sponsors, membership seemed to be blocked. Therefore:

Tip #8: If new members are to be sponsored by established members, make sure information on how to get sponsors is readily available.

Of course, if a member brings a newcomer, he or she most likely would be a sponsor and would usually help find additional sponsors, if needed. But clubs which require sponsors should have a method for providing them for prospective members who come on their own to a club's meeting. Greeters or club officers might be appropriate sponsors.

Another problem for newcomers is highlighted on the second page of *The Radio Amateur's Handbook*: "One of the *first obstacles* for a person seriously interested in amateur radio is finding a local amateur to provide assistance. This volunteer amateur is called an 'Elmer.'" (Emphasis added by author.)

Finding an Elmer should certainly *not* be an "obstacle."

Rather, an Elmer should be immediately available to every newcomer—to prospective hams, to new hams, and—just as important—to established hams who move into a new area.

But there's an additional problem with many Elmers today. They may tell a newcomer something such as, "If you need help, give me a ring."

That's not really much of an offer of help. Elmers should do more than that. One good example is J. V. Rudnick K6HJU of Felton, California, who has been Elmer to scores of hams. He drops by a new ham's shack a few days after they meet. He comes with tools, ready to spend a few hours, if needed, to help find electrical interference, check out a new rig, select an antenna location—all examples from his recent Elmering.

Tip #9: Ensure that every prospective member gets an Elmer—an active Elmer, a real Elmer.

Finally, the essential tip:

Tip #10: Evaluate your club and yourself: How do you think newcomers would rate you?

Are you and your club friendly or frigid? ■

Tester Project: England '83

Wherein you flash-chance transistors, chap.

Reprinted by permission from the May, 1983, issue of *Radio & Electronics World*, 200 North Service Road, Brentwood, Essex, CM14 4SG, England. The transistor tester was designed by R. A. Penfold, 12 The Crescent, Hadleigh, Benfleet, Essex, SS7 2HF.

Transistor testers normally fall into one of two categories: basic units where a flashing light indicates serviceable devices, or calibrated metering circuits which give a rough indication of current gain. Our design is really a cross between these two. It uses a flashing 10-LED bar graph to indicate whether or not the transistor is usable—the number of LEDs activated gives an indication of current gain. This novel system enables checks to be made very rapidly and easily, as well as providing more reliable and informative results than a single-LED tester.

Design

The basic setup used in the transistor tester is shown in Fig. 1. Schematic (a) shows the block connections for testing PNP transistors and (b) shows the slightly different arrangement needed when checking NPN devices.

Looking first at the PNP mode, a low-frequency oscillator drives the base of the text device via a resistor which sets the base current. The transistor is thus switched on only when the output of the oscillator is in the low state (it is cut off when the output is high). A zener diode is used to give a stable output voltage from the oscillator so that a reasonably stable base current results.

The bar-graph driver and display are fed with the voltage developed across the collector load resistor. Circuit values are chosen so that a very low gain device produces only sufficient voltage to activate one or two LEDs, while a very high gain device will activate all ten. So, with a serviceable device being tested, the LED display should flash on and off, and the number of LEDs will indicate the gain.

In the NPN mode, an oscillator, zener stabilizer, and series resistor are again used to pulse the base of the test transistor with a reasonably

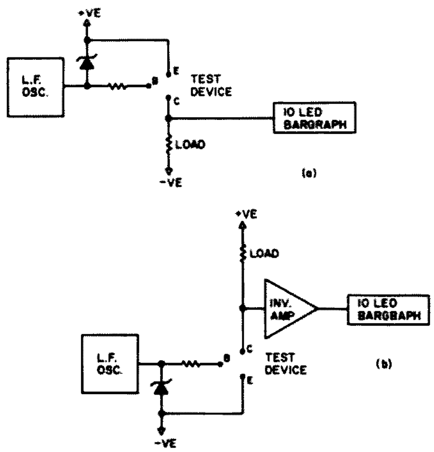

Fig. 1. The two basic circuit configurations for testing NPN and PNP transistors.

CIRCUIT DESCRIPTION

The full circuit diagram of the transistor tester is shown in Fig. 2. The LF oscillator is a straightforward 7555 astable, operating at a little over 1 Hz. IC1 is a CMOS version of the 555, used primarily because of its low current consumption. In order to permit the use of very simple NPN/PNP switching, separate NPN and PNP test sockets are used, as well as separate zener stabilizers and base resistors. In the prototype, there was a tendency for very high gain PNP transistors not to cut off properly due to the output of IC1 going slightly less than fully positive on the appropriate output half cycles. This problem was completely overcome by making R4 and R5 a little higher in value, and adding R3; which have no significant effect on circuit operation in other respects.

The closed-loop gain of the circuit is accurately set at unity by R10 and R13. R6, R7, R11, and R12 are close-tolerance components so that consistent results are obtained when moving from PNP mode to NPN.

R8 and R9 form the load resistance for NPN devices, while R14 and R15 are the load resistance for PNP devices. The value of R15 sets the operating-current range of the unit. It varies from about 450 uA, with one LED switched on, to around 12 mA with all ten activated. This gives a reasonable operating current for low gain devices, whilst removing the need for excessive current flow when high gain transistors are being tested. R14 is added in series with R15 merely to provide additional current limiting if a closed-circuit device is checked.

Switch SW1 is all that is required to give NPN/PNP switching. It switches the input of the display circuit to either the output of IC2 or the PNP-collector test socket (note that IC2 has a class A output stage which enables its minimum output voltage to swing down to near the negative supply potential).

The display driver is an LM3915N integrated circuit (IC3), which is similar to the popular LM3914 device. The LM3914 has ten *linear* LED threshold voltages, whereas the 3915 has a *logarithmic* scale with the LED threshold voltages at 3-dB intervals. This enables a wider range of current-gain values to be covered, with the maximum value being about thirty times higher than the minimum. R16 controls the LED operating current, and the specified value provides around 4.5 mA.

stable current. However, there is a minor complication in that the voltage developed across the load resistor is relative to the positive supply, whereas the bargraph driver requires an input voltage referenced to the negative supply rail. A unity-gain inverting amplifier is therefore used between the load resistor and the display driver to give a suitable input signal for the latter.

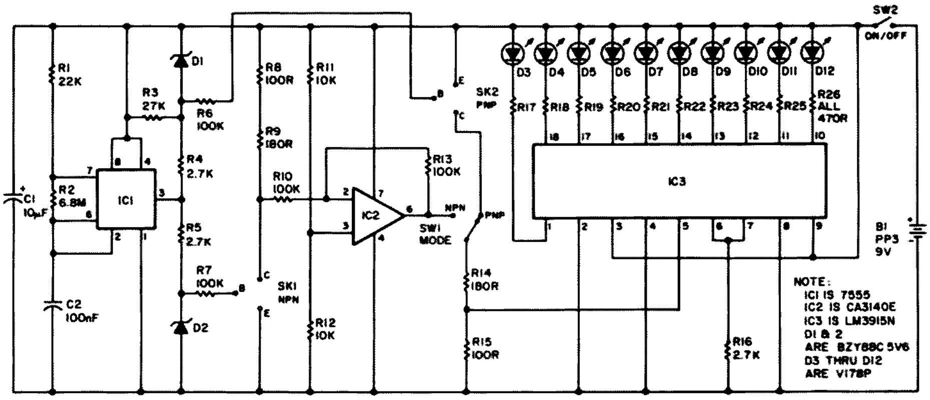

Fig. 2. Complete circuit of the tester.

Construction

Practically all the components are fitted on the printed circuit board, the only exceptions being the battery and the sockets. Details of the PCB wiring are provided in Fig. 3. If the specified case is used, the two cutouts in the corners of the board are necessary to mount flush with the pillars inside the case.

It is essential that the mounting holes for SW1 and SW2 are accurately positioned on the front panel. One way of ensuring a good fit is to use the board as a template. It is probably best to initially drill small guide holes of about 1 mm in diameter.

Construction of the PCB is quite easy, but note that IC2 has an MOS input stage. Although IC1 is a CMOS device, it does not require any special handling precautions. The tags of SW1 and SW2 should be pushed right down into the board before these components are soldered into place.

The test sockets are two groups of three 1mm sockets, and provided each set of three is tightly grouped, it will be possible to fit most transistors directly into these without difficulty. A set of test leads can be used to make connections to transistors that will not plug into the sockets. The tags of the sockets should be bent at right angles so that they do not come into contact with the PCB when it is fitted into the case.

Operation

In use, the mode switch is set for NPN or PNP, and the test device is connected to the correct sockets. If the device is functioning prop-

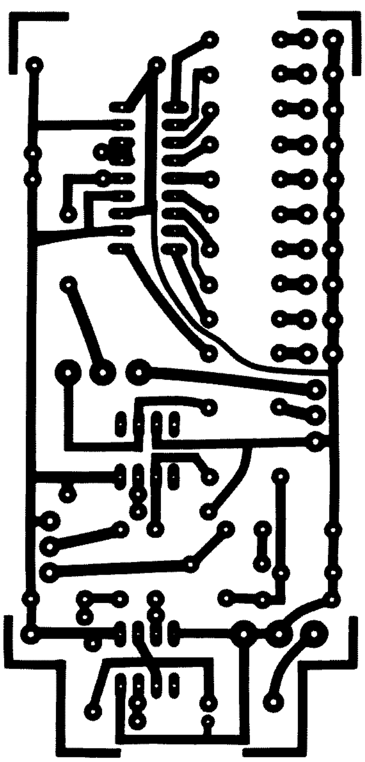

Fig. 3. PC board, foil side.

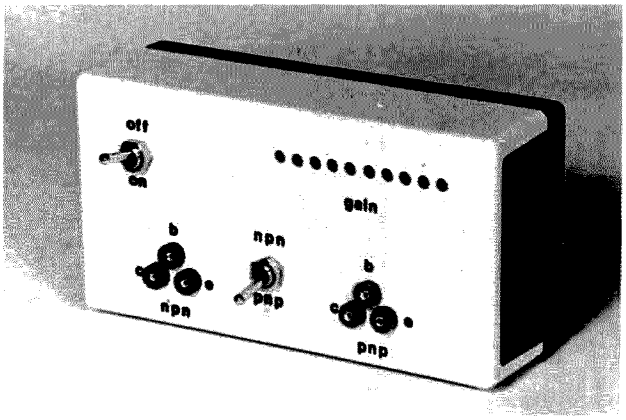

Photo A. The transistor tester.

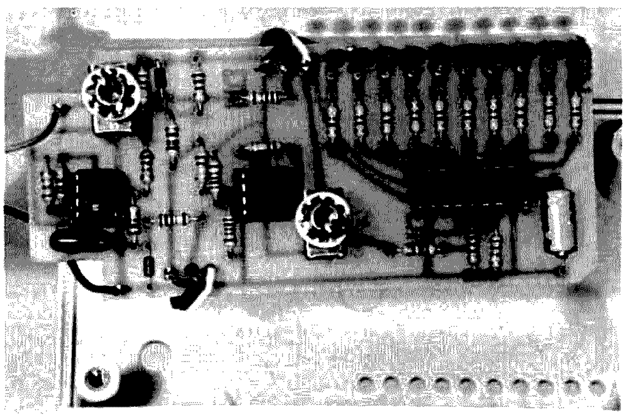

Photo B. Inside the transistor tester.

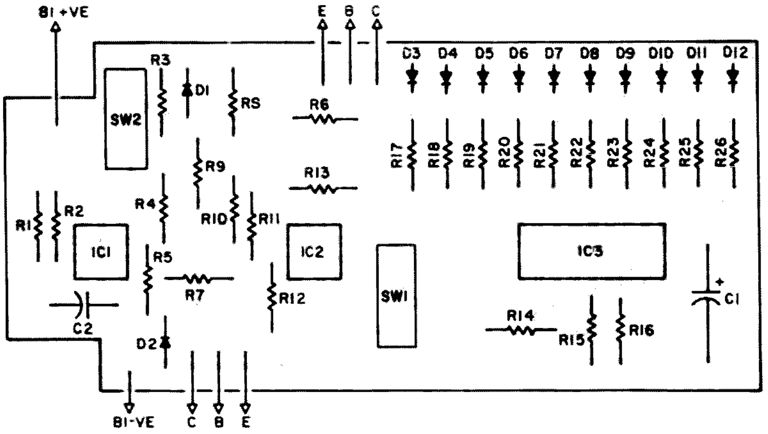

Fig. 4. PC board, component side.

Parts List

Resistors

¼ W, 5% unless stated otherwise

R1	22k
R2	6.8 megs
R3	27k
R4, 5, 16	2.7k
R6, 7, 10, 13	100k (1%)
R8, 15	100R
R9, 14	180R
R11, 12	10k (1%)
R17-26	470R

Capacitors

C1	10 uF, 25 V
C2	100 nF mylar™

Semiconductors

IC1	ICM7555
IC2	CA3140E
IC3	LM3915N
D1, 2	BZY88C5V6
LED1-10	(3mm red LEDs)

Miscellaneous

SW1, 2	SPDT min toggle switch
B1	9-volt battery
SK1, 2	1mm wander

Sockets (see text), plastic case (120 × 65 × 40mm), battery connector, PCB, pins, wire, etc.

erly, the LED display should flash on and off with a suitable number of LEDs being switched on. It is a good idea to test a number of transistors of various types, which are known to be fully operational, so that you know the approximate number of LEDs that should be activated when testing a suspect device.

If the LED display lights continuously, this indicates that the device under test is closed circuit, but check to be sure that SW1 is in the right position and that the device is connected correctly. If not all of the LEDs switch off, this indicates that the test device is faulty and has a high leakage level, but again, check that it is connected correctly and that SW1 is in the right position. Also, do not hold the transistor in the test sockets touching the base and collector leads. This could supply a small current into the base of the component giving a high enough collector current to activate one or two LEDs. If the display fails to light at all, it indicates that the transistor under test has gone open circuit. ■

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Sounds Good to Me

Two Texans put together "73 Morse R/T." It's the best Basic VIC-20/C-64 code program you will ever see.

Three things plague Morse code transmit/receive programs. First, the good ones are expensive. Second, the inexpensive ones don't generate good-sounding Morse. Finally, most Morse programs you enter yourself are in Basic and are too slow to generate or copy well-spaced Morse.

So what have we here? True, it's Basic that you must enter yourself, but before you dismiss it as just another Morse program, consider that "73 Morse R/T" has been carefully assembled to make maximum use of Commodore Basic.

Because variables improve program speeds, the program sections using numbers have been created to use the faster variable method. Morse spacings have been carefully guarded, and this program generates the best-sounding code possible in Basic at speeds from 5 to 50 wpm.

73 Morse Receive/Transmit allows type-ahead buffering of up to 255 characters and three (or more) 255-character message buffers into which may be placed a CQ, station brag tape (rig message), and QTH information.

Additionally, a simple interface schematic is included in this article. With it, your Commodore VIC-20 or -64 can be connected to your radio and be used with 73 Morse R/T on the air.

Two items of caution before describing this program in detail. First, if you make program modifications, add no line number preceding line 200. Any line appearing prior to 200 must be processed between each character sent by the program and even a Remark statement will deteriorate the sound.

Second, we suggest you avoid attempting to enter the Receive mode of this program until you have constructed the interface. If you engage the Receive option without an interface attached, 73 Morse R/T will lock and you will be unable to return to Transmit. Until you have constructed the interface (or attached a suitable one), place a Remark (REM:) at the beginning of program line 255 to prevent the lockup. Remember to remove it when you connect an interface.

73 Morse Receive/Transmit supports the following amateur CW prosigns:

Prosign	Key
AR	)
KN	=
SK	–
AS	@
BK	*
BT	=

In addition, Morse error (eight dits) is sent when Return is depressed or an undefined key is struck. The Run/Stop key is an exception and acts as a Break key; if accidentally depressed, type "CONT(inue)".

This program features a 255-character keyboard buffer. If the 255-character limit is exceeded, excess entries will result in the "string too long" error message. Should this occur, enter "CONT" to resume.

The Delete key may be used in the normal manner to make changes and corrections, providing the character to be corrected has not been or is not being transmitted at the time of the attempted correction.

A transmission may be aborted by using the Clear/Home key, but can be called only from the Transmit mode. Exercising this function results in a clear screen and loss of the buffer contents.

Six 255-character buffers

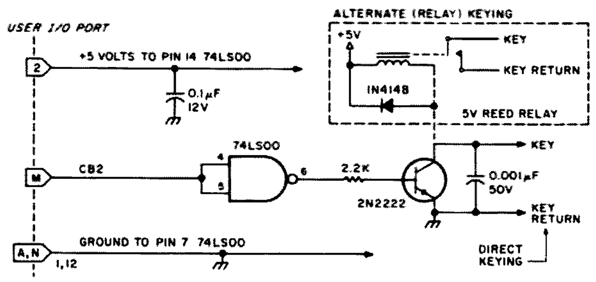

Fig. 1. 73 Morse transmit schematic.

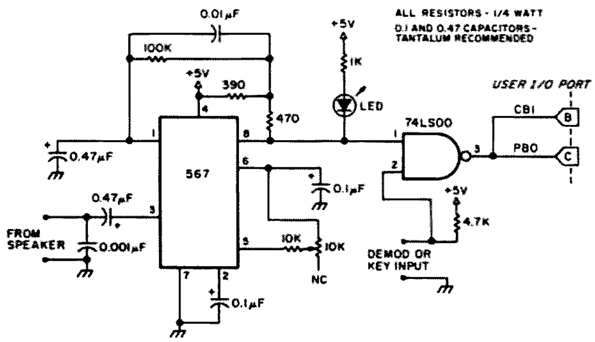

Fig. 2. 73 Morse receive schematic.

are included with 73 Morse R/T. All are accessed from the Function Keys on the right side of the VIC-20 or -64. Earlier, only three were mentioned. The reason for this is that to be useful, one buffer must hold the station callsign input, another the callsign of your station, and the third an HW CPY link.

Although more than suggested data could reside in the preceding three buffers, their function limits the length of the contents. Feel free to change the contents of any buffer (Function Key) as you wish. Details of how this may be accomplished can be understood from reading the following documentation sections.

F1 will send the message contained in program line 310, which in this case is CQ. Any message up to 255 characters in length may be placed in this buffer. You are limited in line length, however, to the default limits of your computer (88 on the VIC-20, 80 on a -64). If your message exceeds these lengths, it is suggested that you add a second line number (in sequence) to complete your message, as illustrated in the link example in program lines 360 and 361. Notice that GOTO 45 appears at the end of the last line of buffer text only and that line contents must be linked as "KS=K$+" on additional lines.

F2 allows you to enter the callsign and name of the station with whom you are engaged. These entries may be left blank, or to change the data you may recall the option and enter a single quote (") when the information is requested. Once a name or callsign has been entered, entering a null will preserve whatever data resides in the memory for those categories.

F3 will send "(his callsign) DE (your callsign)" if a callsign for the station being worked has been entered. Your call must also appear in program line 330.

F4 sends the QTH or other message contained in program line 340.

F5 will transmit "SO HW CPY (name)? (his callsign) DE (your callsign)" followed by the invitation to transmit "(K)". This function demonstrates how two (or more) Function Keys can be linked (concatenated). In this example, F3 is called by F5.

F6 sends the station brag tape (rig message) or the contents of program lines 360 and 361. These linked lines are explained in F1 above. When linking program lines to allow more than the standard line lengths, caution should be exercised on the unexpanded VIC-20, as memory limits can be approached quickly and result in erratic code spacing. Should this happen, abbreviate your messages or add memory expansion.

F7 toggles between Compose and Send modes. When Compose is chosen by a single depression of the F7 key, 73 Morse R/T will allow building your transmission in advance of being sent. It will not function during Receive. Function keys may be embedded during Compose, but remember that the lengths of messages linked in this manner will affect the maximum count of 255 characters. It is easy to exceed maximum buffer lengths unexpectedly in this way. Should an error develop due to this, type GOTO 50 and your transmission will continue with the offending characters removed. Depressing F7 a second time will send your Composed text.

```
10 GOTO200
15 FORL=ITOLEN(M$(A)):S$=MID$(M$(A),L,I):M=T:IFS$="-"THENM=DL
20 POKEV,P:POKEW,K:FORD=ITOM:NEXT:POKEV,Z:POKEW,U:FORD=ITOEB:NEXT:NEXT
30 FORD=ITOBF:GETK$:PRINTK$;
32 IFK$=CHR$(O)ANDB$<>""THENB$=LEFT$(B$,LEN(B$)-I):GOTO30
34 IFK$=CHR$(QQ)THENB$="":PRINT"(SC)":GOTO30
36 B$=B$+K$:NEXT
38 IFB$<>""THEN50
40 GETK$:IFK$=""THEN40
45 B$=K$:PRINTB$;
50 A=ASC(B$):B$=RIGHT$(B$,LEN(B$)-I):1FA>LLTHEN250
60 IFA=BPTHENFORD=ITOWS:NEXT:GOTO38
70 A=A-FF:IFA<ITHENA=I
80 SOTO15
100 IFPEEK(C)=ZTHENL=L+I:IFL<HTHEN100
110 L=Z:IFPEEK(C)=ZTHENPRINT" ";
112 IFPEEK(G)=YTHENPOKE198,Z:SOTO245
115 IFPEEK(C)=ZTHEN112
120 L=L+I:IFPEEK(C)THEN120
130 IFL>HTHENX=X+X:H=(E$H+L+L+N)/F:GOTO150
140 X=X+X+I:H=(H+H+H+L+L+J)/B
150 L=Z:IFX>RTHENX=I:GOTO100
160 IFPEEK(C)=ZTHENL=L+I:IFL+L<HTHEN160
170 IFNOTL+L<HTHEN190
180 IFPEEK(C)THENL=Z:GOTO100
190 PRINTMID$(R$,X,I);:X=I:L=Z:GOTO100
200 DIMM$(51):FORL=1TO51:READM$(L):NEXT:S=20
210 PRINT"(SC)(CR) 73 MORSE SEND/REC";PRINT"(CD)(CD)(CD)SPEED (5 TO 80)(CR)(CR)"8"(CL)(CL)(CL)(C
L)(CL)";
215 INPUTS:IFS<5ORS>80THEN210
220 PRINT"(SC)":POKE36878,15:V=36876:P=230:Z=0:W=37148:K=222:U=254:T=2300/S^1.25
225 BF=T/12:ES=7500/S^2:FF=39:LL=90:SP=32:WS=3$T:DL=3$T:IFS>30THENDL=4*T
230 R$=" TEMNAIOGKDWRUS??QZYCXBJP?L?FVH09?8????+&??/=61????)?@2???3!45"
235 R$=R$+"???????:????,?????(??;????????-??'????????.??'????????????$"
240 B=4:E=9:F=12:H=16:C=37136:G=197:I=1:J=2:N=6:O=20:QQ=19:R=122:X=1:Y=B:POKE37138,254
245 PRINT:PRINTSPC(9)"(RV)XMT(CD)":GOTO40
250 IFA>132ANDA<141THENA=A-132:ONAGOTO310,330,350,370,320,340,360,380
255 IFA=95THENPRINT:PRINTSPC(7)"(RV)RECEIVE(CD)":GOTO190
260 GOTO210
310 K$="   CO CQ CQ DE W5VKC/1 W5VKC/1 K ":GOTO45
320 PRINT:PRINT:INPUT"STATION CALL";C$
325 PRINT:INPUT"NAME";N$
328 PRINT"(SC)":GOTO40
330 K$=" "+C$+" DE W5VKC/1 "+B$:GOTO45
340 K$=" QTH PETERBOROUGH, NH? PETERBOROUGH, NH. = "+B$:GOTO45
350 K$="SO HW CPY "+N$+"? )(??)K";GOTO45
360 K$=" RIG HR   TEN TEC CENTURY/21 INTO A DIPOLE *  KEYING WID A VIC 20 COMPUTER"
361 K$=K$+" = FRIEND NB5AYD WROTE SOFTWARE = "+B$:GOTO45
370 B$="":PRINT"(SC)"SPC(6)"(CD)(RV)COMPOSING(CD)"
371 GETK$:IFK$=CHR$(136)THENPRINT:PRINTSPC(6)"(RV) SENDING (RO)(CD)":GOTO35
372 IFK$=""THEN371
373 PRINTK$;:IFASC(K$)>132THENPRINT"(RV)"MID$("13572468",ASC(K$)-132,1)"(RO)";
374 IFK$=CHR$(20)THENB$=LEFT$(B$,LEN(B$)-1):GOTO371
375 IFLEN(B$)=255THENPRINT"(RV)";:GOTO371
376 B$=B$+K$:GOTO371
380 K$=" DE W5VKC/1 "+B$:GOTO45
500 DATA.-,-...,-.-.,-..,.,..-.,--.,....,..,.---,-.-,.-..,--,-.
510 DATA-----,.----,..---,...--,....-,.....,-....,--...,---..,----.
520 DATA---...,-.-.-.,<,-...-,>,..--..,.-...
530 DATA.-,-...,-.-.,-..,.,..-.,--.,....,..,.---,-.-,.-..,--,-.
540 DATA---,.--.,--.-,.-.,...,-,..-,...-,.--,-..-,-.--,--..

READY.
```

Program listing.

```
20 POKEVO,F:POKEW,K:FORD=ITOM:NEXT:POKEVO,Z:POKEW,U:FORD=ITOES:NEXT:NEXT
205 POKE53281,0:POKE53280,0:PRINT"(WH)(SC)":FORI=54272TO54296:POKEI,0:NEXT
210 PRINTSPC(10)"J/64 MORSE SEND/REC":PRINTSPC(9)"(CD)(CD)(CD)SPEED (5 TO 80)(CR)(CR)"S"(CL)(CL)
(CL)(CL)(CL)";
216 POKE54272,65:POKE54273,51:WF=54276:AD=54277:SR=54278:WV=65:WI=WV+1
217 POKEWF,WI:POKEAD,Z:POKESR,240:POKEWF,WV:POKE54275,S:POKE54274,0
220 PRINT"(SC)":VO=54296:Z=0:W=56576:K=147:U=151:T=2300/S^1.25
240 B=4:E=9:F=12:H=16:C=56577:G=197:I=1:J=2:N=6:Q=20:OO=19:R=122:X=1:Y=57
241 POKE56579,254
245 PRINT:PRINTSPC(18)"(RV)XMT(CD)":GOTO40
255 IFA=95THENPRINT:PRINTSPC(16)"(RV)RECEIVE(RO)":GOTO190
360 K$=" RIG HR TEN TEC TRITON 4 INTO A DIPOLE = KEYING WID A CBM 64 COMPUTER"
370 B$="":PRINT"(SC)"SPC(15)"(CD)(RV)COMPOSING(CD)"
371 GETK$:IFK$=CHR$(136)THENPRINT:PRINTSPC(15)"(RV) SENDING (RO)(CD)":GOTO38

READY.
```

C-64 modifications to 73 Morse R/T listing.

F8 sends "DE (your call)". Useful for IDs and QSK.

Note in line 340 (and others) the buffer (B$) is added to the message, preventing the contents of the buffer from being lost. This enables the messages to be used within text in either the Direct or Compose modes. In the Compose mode only, a reversed number representative of the inserted Function Key will appear within text. Although not represented in Send, the Function Key will be transmitted.

Receive

With a suitable interface connected, Receive may be entered by depressing the back-arrow (escape) key. A second push of the same key returns to the Transmit mode, and in this way the key toggles between modes. The back-arrow key may also be implanted in text. When encountered, the modes will change.

The simplicity of the receive circuitry on the accompanying schematic is roughly representative of the function refinements. Although accurate and flexible, these restrictions suggest several actions to ensure optimum results.

The variable resistor is used to adjust the loop frequency. Loop adjustment should coincide with the center frequency of the CW filtering engaged. For example, a 750-Hz (typical) filter would require your interface loop be adjusted to 750 Hz—the idea being to adjust the LED to brilliance with full filtering engaged.

As a digital device, the VIC requires spaces of silence between Morse characters for recognition. Therefore, rf gain should be adjusted to permit the LED to extinguish between keying. In other words, tune in the desired signal and reduce rf gain to a point where QRM does not keep the LED from blinking. A threshold adjustment (squelch) would be helpful here, but is not within the scope of this article.

Any suitable interface can be driven with 73 Morse Receive/Transmit. The prerequisite is that the interface in use is TTL-compatible and goes low on keying applied to the external DEMOD input on the interface included here.

Although there is an upper limit to receive copy speed, we have successfully decoded 30-word-per-minute CW generated by HAMTEXT and MBATEXT with this program—admirable for Basic. We feel VIC-20 and C-64 Basic has been optimized at this point. Morse transmission at speeds in excess of 65 wpm is possible and has been decoded by the previously mentioned commercial programs. At speeds approaching 80 wpm, 73 Morse R/T is detected with excess spaces but remains readable.

It is important to mention that no CW decoder will copy poorly sent CW. If, for instance, the transmitting station sends a question mark as "IZ", then "IZ" will be displayed.

In view of this restriction to accuracy inherent in all time-based microprocessors, we recommend you remain faithful to your own receiving speeds and not dive into a speedy QSO you can't keep up with should your VIC crash. If you parallel a key alongside the computer, you can always request QRS if your program or VIC crashes in mid-QSO and you find yourself adrift without oars.

Circuit Notes

The transmit section of 73 Morse Receive/Transmit utilizes the CB2 (RS-232 Sout) signal at the User I/O port on the VIC-20 and -64. CB2 will go low when the transmitter is to be keyed. This further enables the Run/Stop/Restore sequence to interrupt keying at any time and prevents the computer from keying the transmitter on power-up initialization or Reset.

For Receive, this program makes use of the PB0 signal at pin C and the CB1 signal (RS-232 Sin) at pin B. PB0 must go high when a received signal is detected. Although CB1 is not used, it is connected in anticipation of the later addition of RTTY and ASCII upgrades.

The 567 tone-decoder IC is available at most parts stores and is common.

A 12/24 .156 spacing connector is required for this interface. Lacking one, a 22/44 pin connector (common) can be cut to fit. The interface may be constructed on a piece of perforated board and the underside of the connector attached to the board with strong (two-part) epoxy. Refer to the manual furnished with your computer for pinouts.

Do not attempt to key a rig which presents more than +30 V or *any* negative voltage at the key terminals with the direct keying portion of this circuit, for damage to your computer will likely result. Provision for total isolation of the type necessary to permit safely keying such transmitters can be made through a common reed relay using the alternate keying section of the schematic.

Acknowledgements

The authors of this program would like to acknowledge conceptual assistance from Jim Thomas W9OAG, whose application of the 567 tone-decoder circuit appeared on an interface card for CW split-screen on the ZX-81 and was used by permission. Additional thanks to Cliff Nunnery NU4V from whom the ZX-81 program and interface are available. Automatic receive-timing adjustments used in this program were based on the equations of J. C. Sprott W9AV, who created them for the TRS-80 computer.

Notes

If in testing this program you notice scrambled CW, look for an added or missing comma in the Data statements of lines 500 through 540.

Users of the Commodore-64 should replace any existing program lines in the VIC version with those appearing in the 64 modification listing, adding those not shown in the VIC listing.

This program previously appeared as J/20 Morse R/T in the bi-weekly *Journal/20* and has been in use for over a year. It is in the public domain. ■

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Piggy-Bank Repeater Project

Set it and forget it.
This inflexible controller doesn't bend the budget.

I know what you're thinking. The last thing this world needs is another repeater control, right? (Some would say the last thing we need is another repeater, period, but that's another matter altogether.)

The past few years have seen a proliferation of microprocessor-based repeater controls offered for sale in *73, HR, QST,* and other magazines. While it's certainly true that these units do offer an amazing array of functions, bells, whistles, and the like, it can be said that such systems may be far more than the average repeater operator needs for simplicity and reliability.

The circuit described here won't win any engineering awards but won't break your bank, either. What's more, all of the parts can be obtained easily. The emphasis is on "set-and-forget" operation, so there are a minimum number of functions to fuss with when performing the final installation. Best of all, this circuit lends itself well to modular designs, such as plug-in cards. In this particular case, this meant the end of the wonderful January trips to the repeater site to troubleshoot in minus 10° weather.

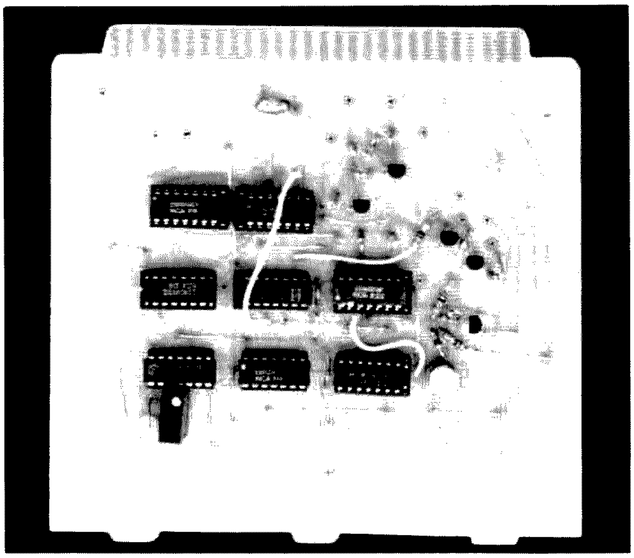
Photo A. Completed board minus the LEDs.

The Split Rock ARA repeater in Rockaway, New Jersey, had used for many years a circuit based on first-generation TTL devices. When it was first built in 1972, it was a pretty impressive piece of equipment! This controller featured a 1.5-second delayed key-up, a diode-matrix ID generator, a "polite" identifier, and used only 22 ICs, 30 diodes, 3 relays, and numerous transistors to do the job. It was constructed on plug-in wire-wrap boards (presumably to allow for some experimentation) and then the wire-wrap was soldered. With attendant power supply, it took up about 12" by 4" by 6"—not a small package.

Well, time marched on. Pretty soon, chips began to fail about the time that various pieces of circuit documentation were mysteriously vanishing. The identifier began cutting itself off in mid-ID, giving us one of the world's shortest calls, "DE W—". Worst of all, the delayed key-up began resetting on every call, resulting in more "doubles" and "triples" than the World Series!

What to do? The repeater users were ready to march on Washington. Everyone grumbled about the situation. The most popular question at our monthly meetings (after "when do we adjourn?") became, "Hey, when are you gonna fix the ID box?? Hunnhh?"

With visions of a lynch mob firmly in mind, the decision was made to deep-six the old control package in nearby White Meadow Lake and redesign a brand-spanking-new controller. Thus would our repeater move into the 80s!

I had experimented with many Rube Goldberg devices over the years for repeater control, being first attracted to a design using 555 timers. No good! The 555 is surely the most versatile IC ever to grace this earth, but it suffers from a problem common to most one-shots: poor noise immunity. My first attempt at a circuit of this type worked great on the bench, but soon wound up in the garbage, as those poor 555s keyed up on every spike within a mile of our site. Sure looked good on paper, though...

A circuit using flip-flops and unijunction transistors soon made an appearance in the March, 1979, *QST,*[1]

and it looked promising. The user "set" the flip-flop upon key-up, and the UJTs "reset" the flip-flop using the classic RC circuit to determine squelch-tail time. Again, not a bad idea on paper. However, in the repeater, it was soon discovered that the user got erratic squelch tails, if any tail was generated at all!

Using tantalum capacitors and precision resistors didn't cure the problem. RFI and timing problems put this model in the circular file. Back to the drawing board! Although the circuit was a clever design, the fact that the capacitor did not always charge completely on each transmission (especially during a series of rapid QSOs) led me away from using any RC-type delay circuits for future designs.

The problem was just too many variables, such as the quality of electrolytics used, type of UJT used, grade of other transistors, and questionable response in extreme environments. However, the basic concept was halfway there—using flip-flop logic and toggling between set and reset modes. Ah-ha! Now I was getting somewhere, and after studying schematics for the 10,000th time, it occurred to me that a better way would be to use clock pulses to do the job. This meant an onboard clock and appropriate divide-by-X chips. And so was born the final circuit (although more out of desperation than inspiration!).

Refer to Fig. 1 for the schematic. Q1 and Q2 serve to isolate any COR lines from the CMOS logic, as well as provide high enough signal levels for reliable keying action. Either positive- or negative-type COR lines can be used, swinging typically from .5 to 8 volts, or vice-versa. U1, a CD4047 free-running multivibrator, serves as the on-board clock. It is set to about 120 Hz at pin 10. The output from U1 drives U2, a CD4040 ripple counter. These two chips make up the heart of the timing circuit and are never disabled while the circuit has power to it. The clock pulses from U2 are fed to three on-board divide-by-seven chips, U3, U4, and U6, which are all CD4024 types and which generate the delayed key-up, squelch tails, and timeout intervals, respectively.

U4 serves an additional function: It resets the delay line after 10 to 12 seconds of inactivity. Or, if you prefer, it can be disabled. When the user opens the squelch on the repeater receiver, the ensuing COR voltage change (either high-low or low-high) will cause Q1 to go low, which in turn also sets pin 2 of U3 low. This COR signal is also sent to pin 12 of U5A, a CD4001 quad 2-input NOR gate. U3 is now counting clock pulses, and after 1.5 seconds, pin 11 of U3 goes high, setting U7A, a CD4013 dual-D flip-flop. Pin 2 of U7A, the $\overline{Q}$ output, goes low. This signal is sent to the other input of U5A, pin 13. Now we're ready for action.

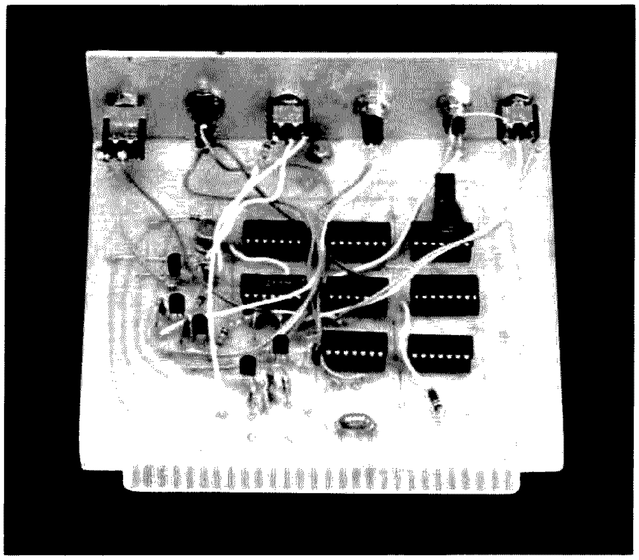

Photo B. Controller built on plug-in card.

U5A at this point goes high through pin 11. This line sets U7B through pin 8, causing pin 12 of U7B to go low. This logic is sent to pin 6 on U5C. Pin 5 is normally set low (we'll get back to it in a moment), with the result that the output of U5C, pin 4, goes high and keys the transmitter through relay driver Q5. When the input signal is released, pin 2 of U4 is set low via NOR gate U5B and after 2.5–3 seconds, pin 11 goes high, resetting U7B through pin 10. This is the squelch-tail circuit. If no further activity is detected after 10–12 seconds, pin 5 of U4 goes high and resets U7A through pin 10. The delay line is back on and ready for the next user(s).

This may seem like a fair amount of work just to kerchunk the old machine, but you'll always get a consistent squelch tail, each time and every time. You turn on

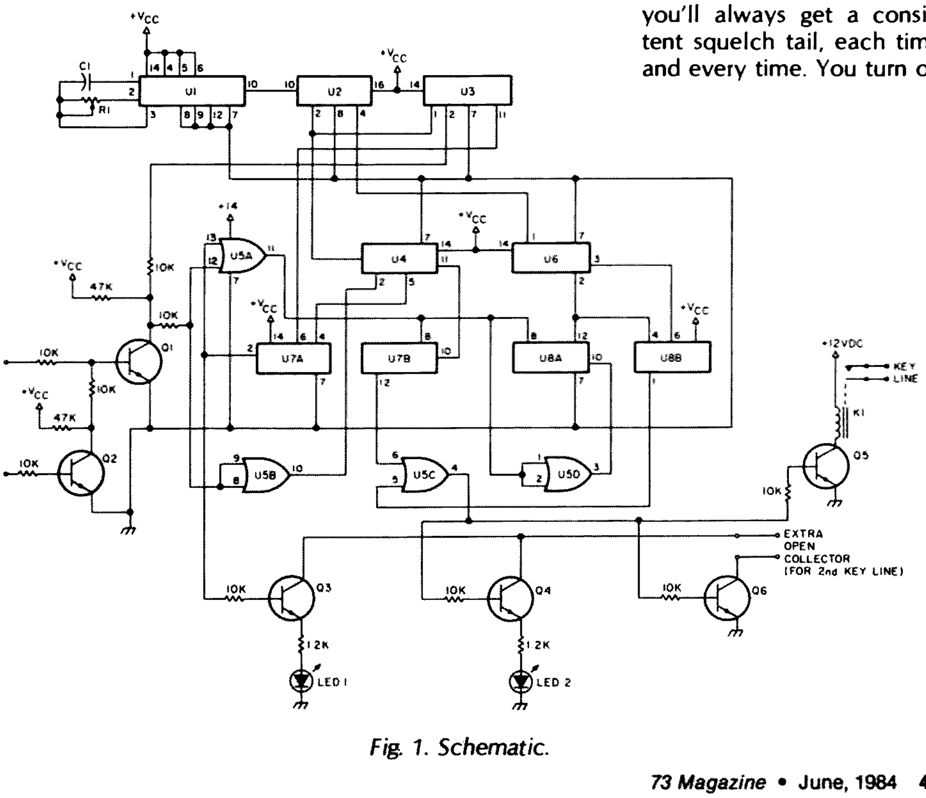

Fig. 1. Schematic.

the various flip-flops and the on-board clock, and counters turn them off, keying the transmitter and dropping it in the process. No noise spikes to fool one-shots, no variable-length tails, timeouts, or delays. Sound good?

Read on! Now you'll find out why I sent you through all those gates and flip-flops. Refer to pin 5 of U5C, the key-line driver. By using a NOR gate here, we've incorporated timeout control, merely by driving pin 5 high. Stops 'em every time! This is easily done by using two more flip-flops—U8A and B.

Let's assume someone has brought up the repeater and is chewing everyone's ear off describing the new Ultra-5000 computerized rig. Remember the COR set conditions: U3 is enabled, U4 is disabled, and U7A and B are in the set mode. Refer again to the schematic and you'll spot U6, another divide-by-seven counter. When pin 11 of U5A goes high, it sets pin 2 of U6 low, enabling the counter. U6 derives its clock pulses from pin 4 of U2 for determining the timeout interval. The Split Rock repeater always had about a 90-second timer, so this program was retained.

As long as pin 2 of U6 is held low, which it is whenever there is activity on the receiver, it will continue to count up to 90 seconds, at which point pin 3 of U6 goes high and sets U8B through pin 6. Pin 1 of U8B then goes high and is sent to—you guessed it—pin 5 of U5C. Pin 4 of U5C goes low and the key line is dropped, shutting off the repeater.

When our hero runs out of superlatives on his new toy and drops the input carrier, several things happen. First, U3 and U6 are immediately reset. U4 is now enabled and its pin 11 goes high, resetting U8A and setting pin 12 high. Like a stack of falling dominoes, this resets U8B, which then resets pin 5 of U5C low, and we're back on the air. You'll get the customary squelch tail, and that's it! Everything is ready for another timeout.

The timeout timer can be reset immediately upon the dropping of each input carrier by using pin 11 of U4, or, if you prefer a short interval for the "beep," pin 9. This will give about a 1-1.5-second interval for reset. The

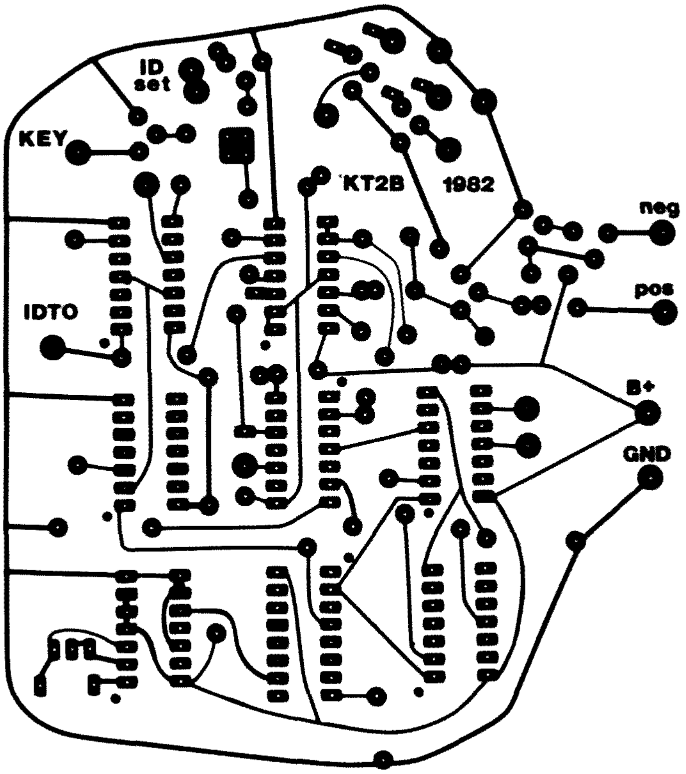

Fig. 2. Printed circuit board.

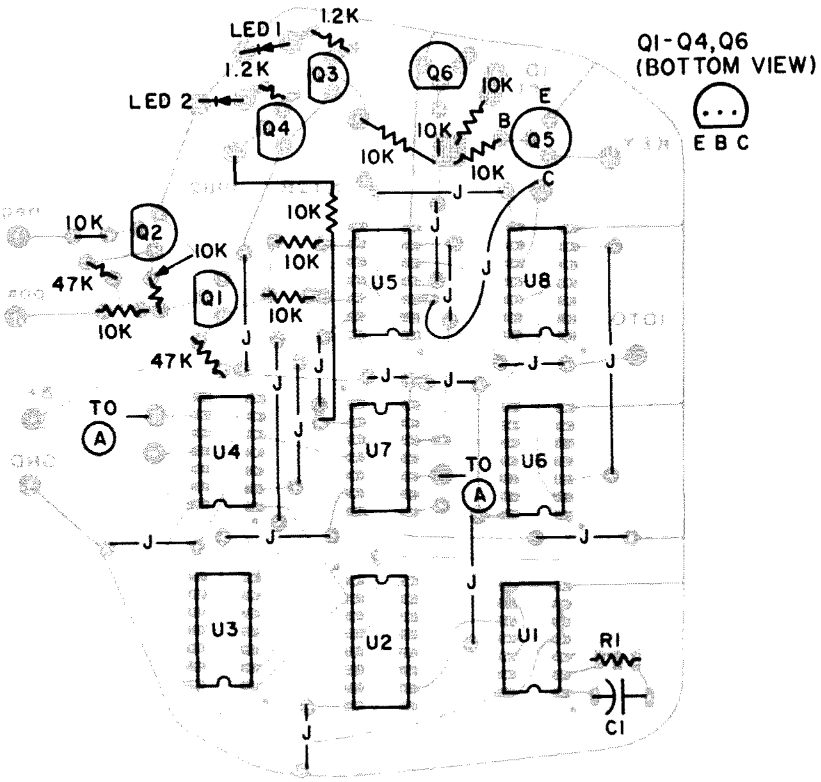

Fig. 3. Component layout.

high-going pulse from pin 9 can be used to activate a beeper, if needed. The time-out program can be changed to the legal limit of 180 seconds by taking clock pulses from pin 13 of U2 and sending them to pin 1 of U6.

That's all there is to it! The addition of a couple of LEDs to indicate DELAY and COR status puts you in business. Photo A shows a completed board minus LEDs, while Photo B shows one version built on a WESCOMM 56-pin plug-in card which SARA uses on K2RF/R. Two built-up boards are now in existence, which means anytime there's a failure, on-site maintenance consists of pulling the bad board and plugging in a new one. The defective unit can be repaired at your leisure in a nice warm place, not some icebox on a hilltop. Photo C shows the difference in size between the old controller and the new version. Fig. 2 shows the circuit board used, and Fig. 3 shows the component layout. If there is sufficient interest, high-quality printed circuit boards will be made available.

One final suggestion: Use good chips. You're trusting the control of your machine to this little bugger, and seconds or grab-bag ICs just won't hack it. A good source for chips would be Jameco Electronics.[2] If you aren't sure if it'll work under harsh conditions, do what I did: Place the board in a plastic bag and toss it in the freezer for about two hours, then pull it out, plug it in, and get the good (or bad) news. Prime chips should handle this test with no sweat.

There is no place to attach the relay to the circuit board since every relay is different. So, do what I've done and glue your relay right to the board on its side—there's plenty of room. Don't forget to bypass the coil with a diode or you may have some problems with spikes.

It's not a whiz-bang micro-based control with 3,000 functions, but on the other hand, you ought to be able to build one of these for under $25.00 with all new parts, and that's a worst-case guess. This unit is ideal for hard-to-get-at locations or for remote links. You can add any type of ID circuit you like; just use the output of pin 11 of U5A to trigger it, through an appropriate transistor.

Have fun! If any questions arise in construction, send along the usual SASE and I'll try to help. ■

References

1. "A CMOS Control Circuit for Repeaters," Donald Dorson W1GBO, *QST*, March, 1979.
2. Jameco Electronics, 1355 Shoreway Road, Belmont CA 94002.

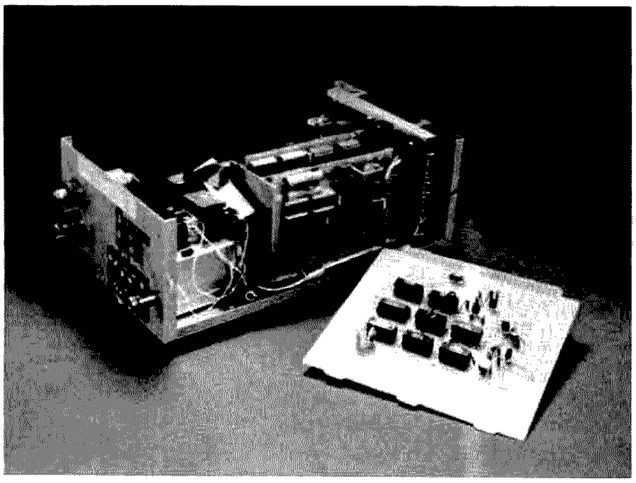

Photo C. Size comparison of the old and new controller versions.

Parts List

U1	CD4047BE mono/astable multivibrator	$.89
U2	CD4040BE 12-stage binary/ripple counter	.79
U3, U4, U6	CD4024BE 7-stage binary counter	2.07
U5	CD4001BE quad 2-input NOR gate	.29
U7, U8	CD4013BE dual-D flip-flop	.78
Q1, Q2, Q3, Q4	2N3904 NPN transistor	1.00
R1	500k linear taper control (63P–500k)	1.10
C1	Mylar™ .022-uF 100-V capacitor	.13
Q5	2N3566/2N2219 NPN transistor	.50
R2, R3	47k, ¼-Watt carbon resistors, 5%	.12
R4–R13	10k, ¼-Watt carbon resistors, 5%	.60
R14, R15	1.2k, ¼-Watt carbon resistors, 5%	.12
D1, D2	Red LED, #XC556R	.69
7 ST	14-pin solder-tail IC sockets	2.03
1 ST	16-pin solder-tail IC sockets	.34
Total Parts		$11.45

Note: All prices are from the recent Jameco catalog.

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Not-So-Famous Garriott Words

In one of his first post-STS-9 appearances, W5LFL spoke at Foothill (CA) College. We record his dedication to amateur radio.

Last February, Dr. Owen Garriott W5LFL described his historic space-shuttle operations in a speech given to over a hundred hams at Foothill College in Los Altos Hills, California. Owen was in the Bay Area to address engineering faculty and students at Stanford University, his alma mater. His appearance at Foothill was arranged by Ted Harris N6IIU, Disaster Services Director for the Palo Alto (California) Red Cross.

Before Owen spoke, college trustee Robert Smithwick W6JZU noted how appropriate it was that the first ham to operate from space should address a group at Foothill, because the college was the original home base for Project OSCAR. Dr. Smithwick also reminisced about the beginning of the space age in October of 1957.

The following is an edited transcript of Dr. Garriott's talk.

Smitty mentioned the events that occurred October 4, 1957. I well remember where I was on that evening. I was a graduate student here at Stanford University, just in the process of looking for some interesting dissertation subject, when all of a sudden the Russians were kind enough to provide the ideal opportunity with this beeping satellite putting out its beeps on 20 and 40 MHz.

On that Friday evening, we went out to the radio-propagation field site (along with a good many other hams) and listened to the sputnik beep its way around the Earth, all of us of course amazed.

The field site was pretty well equipped: We had a number of chart recorders and different kinds of antennas there because the field site at that time was being used for studies of propagation effects. Therefore, we could connect up the output of the Collins receivers to the chart recorders and look at the amplitude and also the very interesting fading pattern, which of course was quite different than any kind of fading that had ever been observed on normal 20-MHz propagation paths.

I can remember the question being asked, "Well, that's puzzling: Why is that fading coming along here at something like a one- or half-a-Hertz rate?" The person who asked was Professor Ron Bracewell, and I suspect he knew the answer to the question at the time he asked. But the question was asked to get us graduate students thinking about it.

Well, that fading, as you all probably already know, turned out to be the Faraday rotation of the satellite signals. As a signal travels down, as it propagates through the ionosphere, its polarization is rotated and that produces the fading pattern which we see on the ground. It was very fortunate for me, as that turned into a dissertation topic in the next year or so.

So I very well remember what happened that October, and it certainly was a very exciting time, that evening as well as for the next year or two, as we began to understand something more about how radio signals propagate through the ionosphere.

Spacelab Constraints

Well, we could go on with some of the historical stuff, I think, for most of the afternoon. There's an awful lot of interest associated with it. But let me talk about events of more recent history, like in the last couple of months. That is, specifically, what we were able to do on Spacelab.

We were on duty for 12 hours a day, and my ham activities were very carefully constrained to make sure that they did not interfere with any of our basic mission objectives. I had a list of 12 items which could not be violated in terms of the ham operations, including such constraints as no more than an hour a day, never when I was on duty, and all these kinds of things. And as a matter of fact, there was no infringement of the main objectives of the flight. We did accomplish all of the scientific activities that we were scheduled to do—and more, in many cases—and I still managed to find a little bit of time for the ham activities in the off-duty periods.

STS-9 Equipment

Now, some of you have perhaps already gotten the February *QST*, so you've seen a picture of the little hand-held transceiver that was used for the in-flight communications. I'll just mention a little bit about some of its characteristics. It was essentially a Motorola design, but it was built by individual Motorola employees during their off-duty time. It may have been a little bit modified from their standard design; I don't really know.

The radiated power was only 4 Watts, but in spite of that, the signal-to-noise calculations showed very good margins. I know the people here at San Jose City College had perhaps as good a calibration as any, and I think your numbers were something like 40 to 43 dB signal-to-noise ratio. And certainly when we were in an attitude in which the antenna was pointed toward the Earth, people could hear from horizon to horizon with an excellent signal-to-noise ratio.

The antenna that we used was also built by hams, these at the Johnson Space Center Amateur Radio Club. It was their own design. It was essentially a single split ring, and then the feedpoint was adjusted around that

split ring until the impedance was matched to the 50-Ohm coax. The measured swr before the flight was 1.2 or 1.3, something like that —really quite good.

The antenna was mounted in a little dish about five or six inches deep and put in the overhead window in the aft flight-deck area, right behind the cockpit area. It worked extremely well. I don't know what the real swr in flight was—I didn't have a meter—but it must have been very close to what we had measured prior to flight on the ground, because the performance as near as we could tell was absolutely nominal and gave very good results.

I had to take the antenna down after every operation, because it really filled up one of these overhead windows and the other crew members preferred to have the opportunity to look out instead of at the back of this metal dish. And so, after each pass on which I was using it, I took it down and sort of taped it over to a side wall where it was out of the way. And then I just took a few minutes to put it right back up in the overhead window again when the next opportunity came along.

U. S. Passes

We had publicized, as I expect most of you know, what the most favorable opportunities would be. We indicated that not all of those listed would be possible in flight, and that's the way it turned out. But still, most of my operations were among those that were listed in the pre-flight forecasts.

We got an extra day extended to the flight, and of course we had no predictions for those, but a lot of the good hamming opportunities came in just the last two or three days of the mission. By that time, I think people pretty well knew how to use the orbital elements that were transmitted by the ARRL, and I suspect most of you knew pretty well when the spacecraft would be coming over, because certainly it sounded as though there were plenty of people on the ground who knew when to transmit.

Dr. Owen Garriott W5LFL speaks at Foothill College about his STS-9 amateur-radio activities. (Photo by Jim Koski KT6W)

One of the most interesting passes came right down across the Mississippi Valley on either the last or next-to-last day in orbit. I've had reports from people on both the east and west coasts who were able to hear those transmissions. In this case, the antenna was pointed right down toward the Earth, and signals were received well beyond the actual geometric horizon. Probably some refraction in the ionosphere, a little bit of refraction around the limb of the Earth, would account for the fact that the signals were really heard over a substantially larger distance than a geometric straight-line path.

It also turned out that even when the antenna was pointed toward the sky, there was enough of a side lobe around the edges of the vehicle that some transmissions could be heard on the ground, and vice versa, although of course signal levels were very much lower than when the antenna was pointed in an optimal direction.

Special QSOs

A number of special contacts were established. For example, I talked with my home ham club in Enid, Oklahoma, W5 Hot Tea Kettle, where I started when I was a teenager. My mother was at the shack, so I had a few moments to exchange a greeting with her. And on the same pass, headed toward the southwest, we passed over the Johnson Space Center where my sons were at the local ham club. So it provided an opportunity to exchange a few words with them.

I think most everyone knows that Senator Barry Goldwater has been very important to our ham activities by supporting ham interests in Congress. I had a special opportunity to talk with him for a few seconds passing down the east coast. And also, very fortunately, I talked with W1AW. They were competing right along with everybody else and managed to show up on one of the published frequencies.

King Hussein was another interesting brief conversation. Of course, there's not a lot of competing activity flying over the Near East, so I didn't have too much trouble having a very nice brief conversation with him.

Shuttle Communications

One final contact I want to mention came when we were flying over Australia. One of our astronaut personnel, Dr. Joe Kerwin, is on assignment in Australia near the NASA tracking station at Canberra. We talked with the hams there, and they went out and set up a fairly high-gain antenna at one of their tracking locations—it's still ham gear, however—and I prearranged a time and frequency to meet with them.

We had it arranged that I'd set up the communication via the ham link, but then they would patch me in via their federally-leased telephone lines back to the capcom [capsule communicator] in Houston. So I talked to Joe briefly and to all the hams at that station, and then they patched me in to the federal line and I talked to the capcom, who was communicating with the spacecraft via the normal channels from the control center in Houston. And the quality of that transmission was better than the normal Ku-band transmissions. It very much impressed the other members of the flight crew and the flight commander, John Young.

John is also the head of the Astronaut Office, and I think there really is a genuine interest in the possibility of having something like this available for a backup communications mode in the future. Whether or not anything develops from that, I don't know. But I think his interest is significant, and others in the NASA administration have also mentioned that to me.

Advantages of 2 Meters

I think 2 meters was a good choice for the operation. Some people have asked me since, "Well, shouldn't we go to higher frequencies?" or "Shouldn't we go down to HF and look for more interesting propagation effects?" All those things are interesting to think about, and we might want to consider something different on another occa-

sion. But for this first opportunity, I think 2 meters was exactly the right choice.

First of all, the Doppler shifts are about plus-or-minus 3.5 kHz, and if you can imagine using anything other than an FM receiver—say, single sideband—you'd be continually trying to track and take out that Doppler shift, both on board and on the ground. It would be a terrible job. With all the hundreds of signals being received and everybody having different Doppler shifts, it would be a hopeless task. Working with an FM discriminator, of course, any place you operate along the passband of the center part of that discriminator circuit, it'll take out the Doppler shift for you. So that was an enormous advantage immediately.

And the second thing about an FM circuit is that it also tends to select the strongest signal and suppress the others. That was also extremely important from the practical standpoint of trying to pick out one or two stations from maybe a hundred that were calling on each of the uplink frequencies. So the FM transceiver at 2 meters was really an ideal choice for this first effort.

Future Changes

All in all, it's just hard to imagine how we might have done things much differently, although I do want to make a couple of points about that.

First, you'll see in that picture on *QST* that I was operating with a very lightweight headset, just a little single bar over my head with one earpiece and a little sponge underneath that. This was designed for working in the spacecraft, so that I could hear all the other things going on around me. That was important for using it in a spacecraft environment for other purposes, but it was a difficulty in working with ham equipment. There was too much outside noise. What I really needed was a pair of good headphones that would really isolate me from the outside world.

And then, the only really serious thing, there was no variable adjustment on the squelch circuit in the transceiver. And the squelch circuit operated such that it compared the signal at the center of the band with what it interpreted to be noise coming in from the outer edges of the passband. Well, with plus-or-minus 3.5 kHz, all these other signals coming in provided what the receiver thought was a lot of extra noise in the fringes of the passband. Therefore, it would often decide, "Well, the signal isn't stronger than the sideband noise, therefore I'll turn on the squelch, because it's not a strong signal." And that way, the whole receiver would be deadened, whereas really I had plenty of good signals there, but no opportunity to inhibit the squelch. So that is the one design feature that I'm sure we would change the next time around.

Mission Successful

Outside of that, things went really beyond our expectations. Every objective we set before the flight was achieved during the time I was able to operate. I was on the air for something like four or five hours total, and during that interval, something like 350 two-way contacts were established. And the ARRL has about ten thousand requests for SWL reports. So it was really very widely participated in by both hams and SWLs. It was a marvelous opportunity and a great pleasure for me to have had this chance to operate from space. And I'm just sorry I'm couldn't have had a two-way with every one of you who tried to contact me. ■

Better the R-70

At your own risk, you can soup up one of Icom's super receivers. How to do it was not read here.

Tom Carlson KE4AQ
Box 4716
APO NY 09109

Being an avid SWBC DXer, I have read with interest in many publications the consistently favorable reviews given to the new Icom R-70 HF receiver. I have been SWBC DXing for a period of time using a high-quality portable receiver, but I finally reached the point where I needed to upgrade to another level to snatch some of the weaker stations I sought. With this idea in mind, I recently purchased an IC R-70 and have been having a ball ever since.

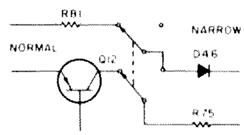


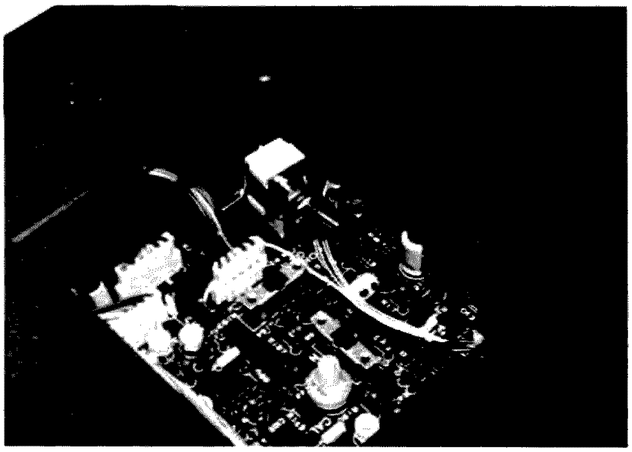
Fig. 1.

In the AM mode of operation, the passband tuning allows the passband to be varied from 6 kHz to 2.7 kHz. In the SSB mode, the passband can be varied from 2.3 kHz to 500 Hz. This is indeed sufficient for many applications, yet it seems that many of the rarer DX stations that I sought were sandwiched between two or more powerhouse SWBC stations at ± 5 kHz. Needless to say, the resultant cochannel interference would many times render my desired station unintelligible, in spite of the passband tuning.

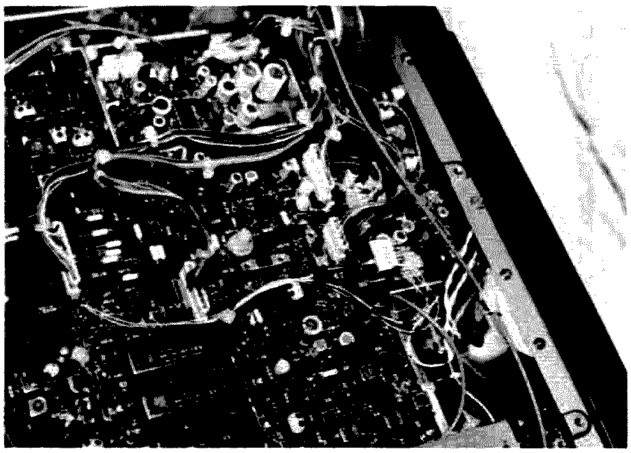
It was at this point that I pulled out the schematic diagram and began investigating the possibility of switching in the narrower-bandwidth ceramic SSB filter instead of the standard ceramic AM filter.

The steps that follow will

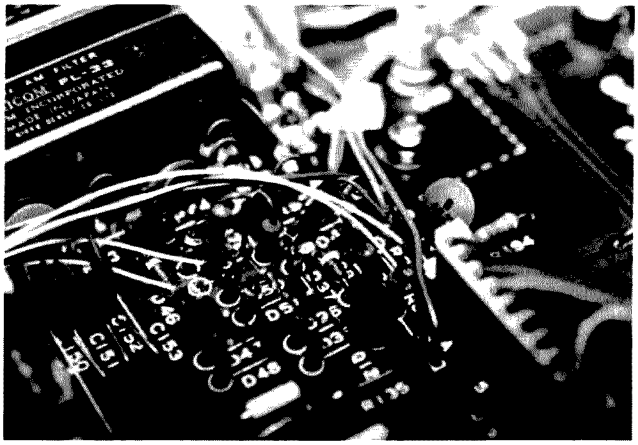
Photos by D. A. Carlson



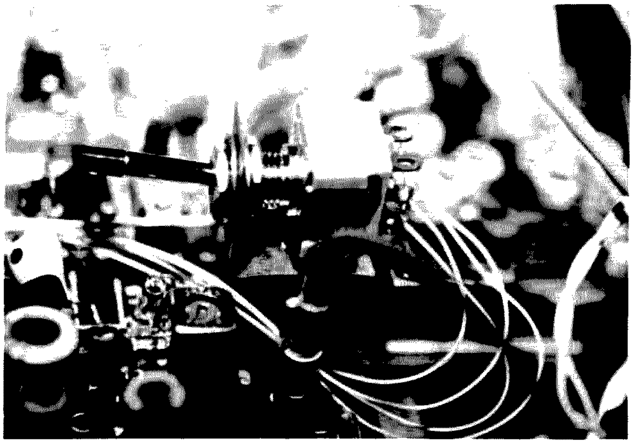
Completed conversion. The switch may be accessed with ease through the top trapdoor.



Routing of wires from the switch to their respective connection points.



Wires connected as per schematic diagram.



Mounting bracket formed from a bent spring clip.

describe the modification of the Icom R-70. At the 3rd i-f of 455 kHz, the SSB filter of 2.3 kHz will be switch-selectable to replace the standard AM 6-kHz filter. While this cut down on the fidelity of music and some voice transmissions, in many cases it dramatically reduced the co-channel interference problem. It allowed me to pull more than a few signals out of the mud. Physically, no components are removed and nothing is done to the receiver that cannot be reversed.

The parts and tools required are:

- 1 DPDT toggle switch (small)—ALCO MTB206N or equivalent
- 2 feet of hook-up wire (20-24 gauge)
- Solder sucker or solder wick
- Needle-nose pliers
- Side cutters and wire strippers
- Phillips screwdriver
- Soldering iron and solder
- Schematic diagram
- Parts layout diagram

1. Remove the 12 screws that attach the top cover to the chassis of the receiver and lift the cover off.

2. Remove the 7 screws that hold the main circuit board in place and lift up the main circuit board. The wiring harnesses connected to the circuit board do not have to be removed.

3. With the parts layout diagram and schematic diagram, locate R81, R75, D46, and Q12 on the main circuit board.

4. Using the solder sucker or solder wick and needle-nose pliers, lift the end of R81 that is soldered into the same foil track that holds the anode of D46.

5. As in step 4, lift the end of R75 that is soldered into the same foil track that holds the collector of Q12.

6. Cut 4 6-inch pieces of hook-up wire. Solder wires to the following points:
(a) the free end of R81
(b) the free end of R75
(c) the hole that formerly held the end of R75
(d) the anode of D46

7. These 4 wires will be soldered to the DPDT switch as shown in Fig. 1. The wires should be routed and dressed neatly to where you elect to mount the switch. The photos will demonstrate one possibility.

I mounted my switch to one of the screws that hold the main circuit board into place. A bracket was formed from a spring clip bent to 90 degrees, a 1/4-inch stand-off spacer, and a long bolt with lock washers. This held everything to the main circuit board and chassis (see photos). Use your imagination on this one and see what you can come up with from your junk box. I am able to access the switch with ease through the trapdoor in the top cover.

In one position, the circuit is in its normal configuration. In the other position, the SSB filter is substituted for the AM filter to greatly improve selectivity. It must be kept in mind that this conversion affects the AM mode only. The switch must be returned to the normal position when other modes are used although no harm will occur if the switch is mistakenly left in the "narrow" position.

This option has proven invaluable on a number of occasions and improves on what is already an exceptional receiver. ■

✓See List of Advertisers on page 114

Elegant Rotating

K9AZG did it right. W4RNL makes it better. For sightless and sighted hams alike, this update to a 1982 article will be revealing.

L. B. Cebik W4RNL
2514 Dereck Drive, Apt. H-1
Knoxville TN 37912

A simple and elegant solution to setting beam headings for both blind and sighted hams is the K9AZG automatic beam aimer (*73,* November, 1982). With a few voltage comparators, transistors, and relays (plus the usual passive and power-supply components), the device controls CDE and similar rotator control boxes so that by setting a single potentiometer, the operator can step back and relax as the beam turns to the desired heading and stops. Sightless hams now have an easy way to determine beam headings reliably, while the sighted ham can use the beam-turning time for tune-up, logging, and other activities.

The original automatic beam aimer used two sections of an LM339 quad voltage comparator to detect the desired change of direction, as shown in Fig. 1. (Fig. 1 is redrawn from the original to show the individual comparators.) Each comparator controls a transistor switch and relay which in turn control the clockwise and counterclockwise switches of the CDE box. Like any good idea, we can improve upon the original and overcome some potential problems. This article describes some improvements which will prevent a few problems that some CDE rotator owners may encounter with the original design.

The Basic Idea

The basic idea behind the

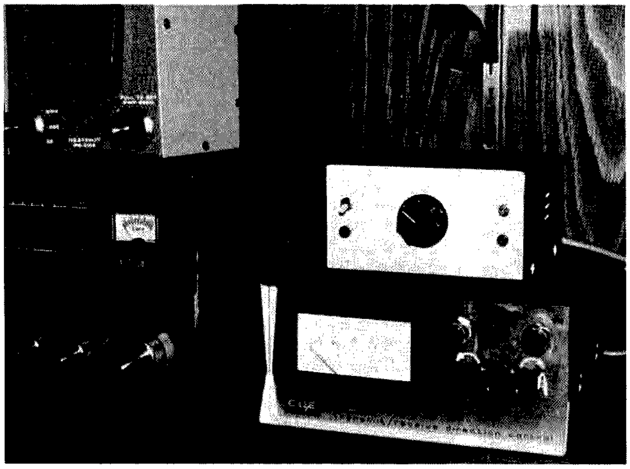


Photo A. The completed beam aimer sits atop the rotator control box at the W4RNL operating position. The ac switch and power LED are to the left and the clockwise and counterclockwise LEDs are to the right. The center knob is the direction control prior to the addition of calibration markings.

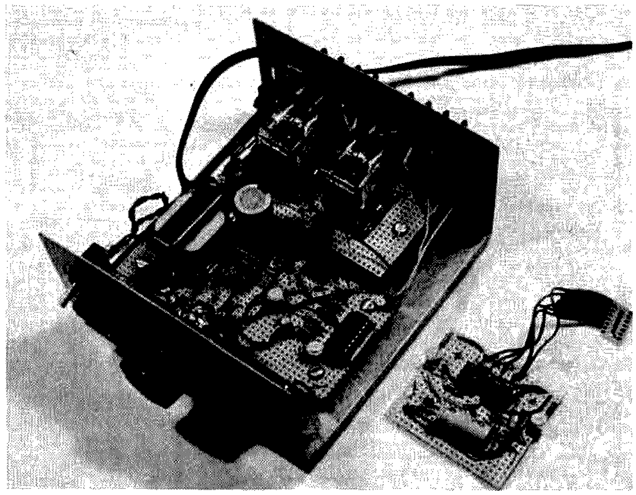


Photo B. An interior view of the quick-fixed beam aimer with the improvement board to the right. The front perfboard contains the power supply and circuitry, while the rear board contains the relays (only two needed for the CD-44).

automatic beam aimer appears in Fig. 2. The 500-Ohm potentiometer in the rotator head changes value with direction, standing at mid-scale when the beam points north and at one of the extremes as the beam points south. Fed by an ungrounded 13-volt supply, the rotating arm creates a ground, thus changing the voltage across the left and right legs of the pot as the beam moves. From extreme point A to center we get a negative voltage; from point B to center we get a positive voltage; and the absolute values of the two add up to 13 volts.

A second potentiometer across the rotator pot (say, about 25k) will read 13 volts across its extremes. More significant for beam aiming, the voltage between the moving arm and ground will be zero when the arm and the rotator pot arm are equal percentages away from the same extreme point. If the beam points north and the second pot is mid-scale, the voltage at the second pot arm will be zero. If we move the second pot counterclockwise, leaving the beam north, we will show a positive voltage. We get a negative voltage if the second pot arm is clockwise with respect to the beam heading. Together, these voltages allow us to turn on one of two relays that close in parallel to the CDE switches, thus activating the rotator. That is the function of the K9AZG circuit.

The maximum voltage that the comparators in Fig. 1 can see is either plus or minus 13 volts. When the antenna is counterclockwise south and we move the second pot arm clockwise to the other extreme, the arm shows −13 volts to ground. In the opposite condition, when the antenna is clockwise south and the pot is fully counterclockwise, the arm shows +13 volts. If both the antenna and the second pot are at either extreme, the pot arm ideally shows zero volts.

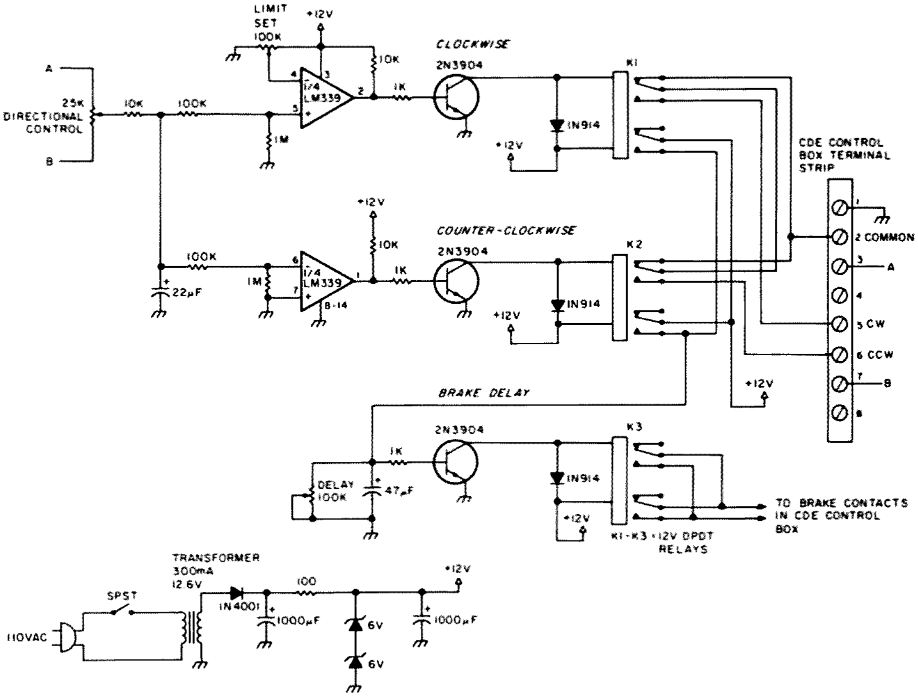


Fig. 1. The original K9AZG automatic beam aimer (redrawn).

Design Limits and Quick Fixes

Unfortunately, only sometimes can we achieve the ideal conditions noted above. There are two design limits to the original beam aimer that may present problems to some hams. First, the CDE rotators have limit switches to shut off either clockwise or counterclockwise rotation at the south heading. Among other functions, the limit switches serve to keep us from wrapping antenna cables like vines around the rotator and mast stub. The limit switches may leave some residual voltage at either end of the scale. Imagine that the limit switches cut off the rotator at positions X and Y in Fig. 2. If the second pot is at its extreme, some small voltage will exist and the relay will not open. K9AZG counters this at one end of the scale with a calibration pot, but the other end of the scale goes to ground.

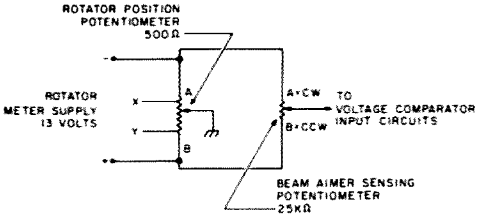


Fig. 2. The basic elements of beam aiming

The quick fix for this problem is the substitution of a low negative-voltage circuit to replace the ground connection of pin 7 of the LM339. Fig. 3 shows a suitable circuit using minimal

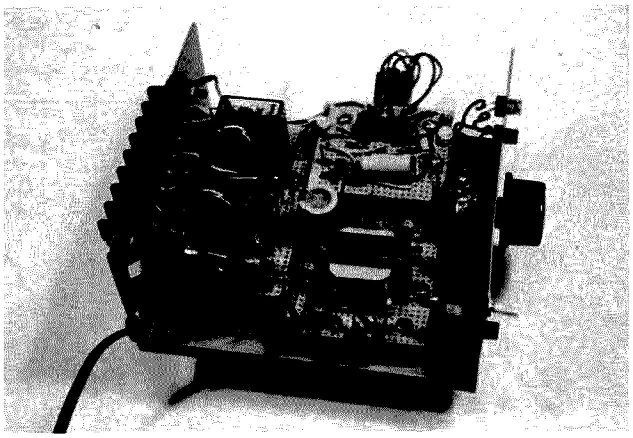


Photo C. An interior view of the improved beam aimer shown from the opposite side of the case. The new input board stands on half-inch pillars over the LM339 socket and transistors. The feedthrough barrier strip for rotator-control-box connections is visible at the rear of the cabinet.

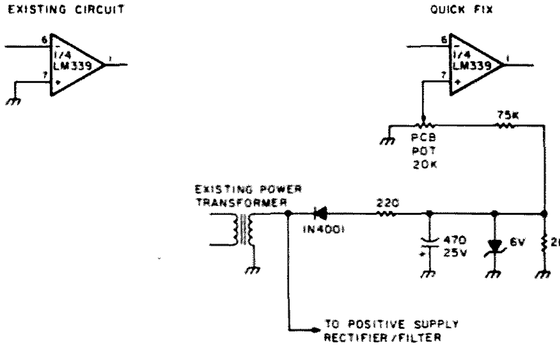


Fig. 3. Eliminating residual negative-voltage effects.

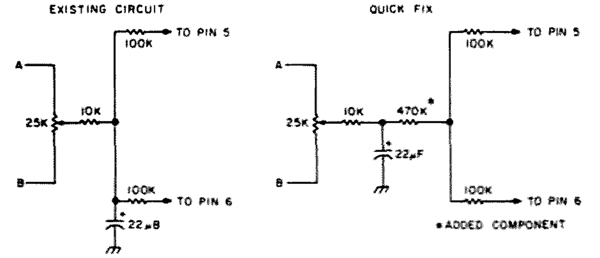


Fig. 4. Input changes to reduce excessive negative voltage.

components. The 20k pot trims the clockwise limit voltage to match the rotator cutoff point.

The second design limit concerns the LM339. This quad voltage comparator is not designed for negative input voltages on either the signal or reference lines. National Semiconductor limits negative excursions to −0.3 volts in their rating sheets. Experiments on half a dozen 339s in the shack showed that between 6 and 8 volts negative input, the comparator would cut off. There was no permanent damage, and the 339 section would come back on when the negative voltage dropped below the limit toward zero.

The effect of this limitation is that when the antenna is fully counterclockwise and the second pot arm goes fully clockwise, the comparator and its relay open up as the second pot passes east (i.e., about −7.5 volts). Thus, a rapid excursion from southwest to southeast might result in nothing happening or might require directional adjustments in small steps.

The quick fix for this design limit is to keep the second pot arm voltage less than the comparator limit. Adding a 470k resistor between the 22-μF capacitor and the branching 100k resistors to the comparator inputs, as shown in Fig. 4, will keep the maximum voltage below 7. The beam aimer becomes a bit less sensitive since now each volt represents around 50 degrees of rotation rather than 28 degrees. However, control is positive, and precision remains quite adequate.

For those hams using the CD-44 and similar rotators, the third relay in the K9AZG design is unnecessary since there is no separate brake-solenoid circuit to control and no required delay between the direction switch and brake-switch release. To discover whether your rotator requires the third relay, check the rotator schematic in the operator's manual. If pin 2 in the rotator is not connected to a brake circuit, then the unit uses an automatically-engaging disc brake. For this class of rotator, the extra relay contacts in the clockwise and counterclockwise switch relays may be connected in parallel and used to control directly the "brake" switch, which actually is a master ac switch for the rotator. Use K9AZG's precautions of bringing the ac to a female socket on the CDE control box rear panel and then to the beam-aimer cabinet.

Fig. 5 shows all the modifications combined in a unit that works well with the CD-44 rotator. These quick fixes, however, are not the best possible design for the beam aimer.

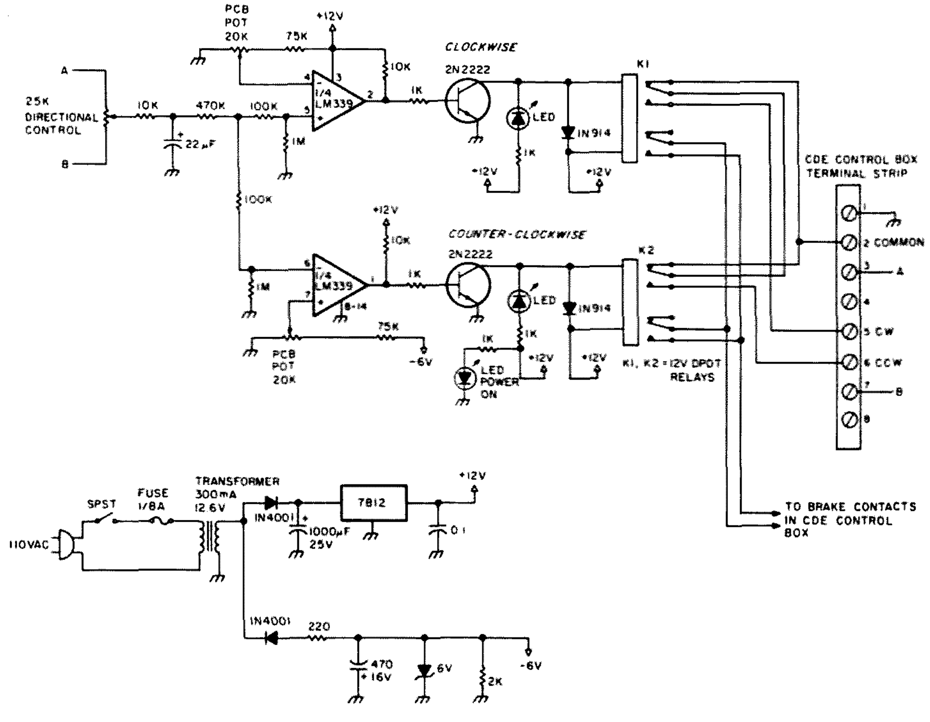


Fig. 5. A simplified beam aimer for the CD-44 and similar rotators.

Improving the Beam-Aimer Design

The automatic beam aimer can be more generally improved by a little redesign. Fig. 6 shows the full set of improvements. First, using LM311s with a dual supply from one 12-volt transformer is simple enough, and it provides for both positive and negative trimming of the voltage-comparator reference lines as well as permitting the 311 to accept a +13- to −13-volt excursion. The uncommitted collector of the 311 output allows for a zero-to-positive output swing to control the switching transistors. This design thus overcomes both limitations of the original.

Second, a slight redesign of the delay circuit for the brake control (which is

needed for larger rotators using brake solenoids) will overcome a further potential problem. The slow decay of the base voltage in the orginal brake-relay circuit can create contact chatter and possible arcing as the coil voltage drops in the transistor-collector circuit. Additionally, the transistor may draw an excessive load while the base voltage drops through the linear range toward cutoff. To create a very positive switching action, we need add only one more LM311, using it to set the delay. Its output switches rapidly, turning the transistor on and off with equal speed. In addition, we can add a variable delay to the 311 circuit and choose a value with the printed-circuit-board pot during initial adjustment.

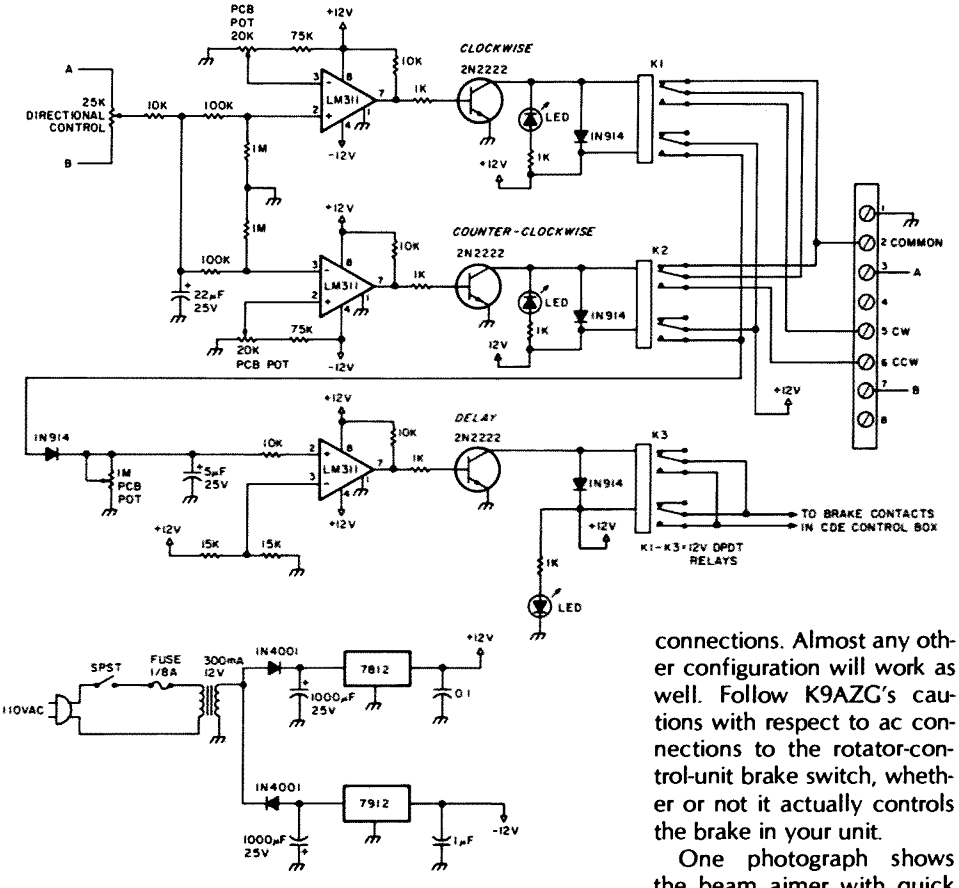


Fig. 6. An improved automatic-beam-aimer design.

Construction

Construction of the beam aimer in any version is straightforward and well covered by K9AZG. Perfboard works well for prototypes, although printed-circuit-board versions would make an excellent club project. The photos show the W4RNL layout. In both photographs, the rear board containing the relays for a CD-44 rotator is mounted a full inch above the case bottom to clear the socket pins. For the CD-44, the delay circuitry was omitted. The forward board containing the power supply and comparator circuit rests on half-inch pillars to ease front-panel connections. Almost any other configuration will work as well. Follow K9AZG's cautions with respect to ac connections to the rotator-control-unit brake switch, whether or not it actually controls the brake in your unit.

One photograph shows the beam aimer with quick fixes prior to modifications for the LM311 comparators. To one side of the LM339 board is the LM311 circuitry board which supplanted the quick-fix version of the aimer in the case. The new

Parts List

Part	Quantity Fig. 5	Quantity Fig. 6	Radio Shack Number
Transformer, 12 V, 300 mA	1	1	273-1385
Ac switch, SPST toggle	1	1	275-612
Fuse, 3AG, 1/8 to 1/4 A	1	1	170-1270
Fuse holder, clip-in	1	1	270-739
1N4001, 50-piv power diode	2	2	276-1101
7812 12-V regulator	1	1	276-1771
7912 − 12-V regulator		1	*
6-V zener diode, 1 W	1		276-561
1000-µF, 25-V electrolytic capacitor	1	2	272-1032
470-µF, 16-V electrolytic capacitor	1		272-1030
22-µF, 16-V electrolytic capacitor	1	1	272-1026
5-µF, 16-V electrolytic capacitor		1	272-1024
1-µF, 50-V tantalum capacitor	1	1	*
.1-µF, 50-V tantalum capacitor		1	*
LM339 quad comparator	1		276-1712
14-pin DIP socket	1		276-1999
LM311 voltage comparator		3	*
2N2222, NPN switching transistor, TO-92	2	3	276-1617
8-pin DIP socket	2	5	276-1995
1N914 silicon signal diodes	2	4	276-1620
LEDs, colors to suit	3	3	276-1622
Relay, 12-V, 75-mA coil, DPDT 3-A contacts, socket	2	3	275-206
Terminal strip, barrier or feedthrough, 8 contact	1	1	274-653
25-kilohm potentiometer, panel mount, and knob	1	1	*
20-kilohm PCB potentiometer	2	2	217-336
1-megohm PCB potentiometer		1	217-338
220-Ohm, 1/4-W resistor	1		
1-kilohm, 1/4-W resistor	5	6	
2-kilohm, 1/4-W resistor	1		
10-kilohm, 1/4-W resistor	3	5	
15-kilohm, 1/4-W resistor		2	
75-kilohm, 1/4-W resistor	2	2	
100-kilohm, 1/4-W resistor	2	2	
470-kilohm, 1/4-W resistor	1		
1-megohm, 1/4-W resistor	2	2	
Case, about 5" wide, 6" deep, 3" high	1	1	270-253
Perfboard (cut from 4½" by 6", or make PCB)	1	1	276-1394

Miscellaneous wire, rotator cable, solder, terminal pins, ac cord, grommet, etc.

*Note: Parts not listed with R.S. numbers are available from DigiKey, Jameco, and other mail-order sources; or experiment with the nearest available value.

Total estimated cost with new parts: $25 to $35.

board contains its own negative regulator, replacing the low-voltage zener used in the quick-fix versions, as well as the 311 comparators and new input resistors. Removing the IC from the original version permitted easy substitution of the improved circuit. Except for a power lead to the negative supply and an input lead from the direction potentiometer, all other connections go through a DIP cable and plug into the vacated LM339 socket. As the second interior photo shows, the new board mounts above the 339 socket and transistors on half-inch pillars. The increased sensitivity to small knob rotations, with preservation of all of the quick-fix benefits, made the installation well worth the effort.

The mode of construction illustrated in the photographs resulted from continuing experimentation with the circuitry. I do not recommend it except as an example of how noncritical dc circuits are with respect to layout. Any convenient layout will do, including possible installations inside the CDE rotator cabinet.

These design improvements are slight overall but they may serve to keep a first-time builder from growing discouraged in the process of trying the automatic beam aimer. Without knowing where to look for clues, the source of anomalies can be frustrating. However, K9AZG's basic idea is both sound and elegant in its simplicity. So too were his motives. If you know a sightless ham who needs a better way to control his or her beam direction, follow K9AZG's lead and build a version of the automatic beam aimer. The satisfaction of helping a fellow ham get additional fun out of operating will more than repay the small investment in easily-available components. ■

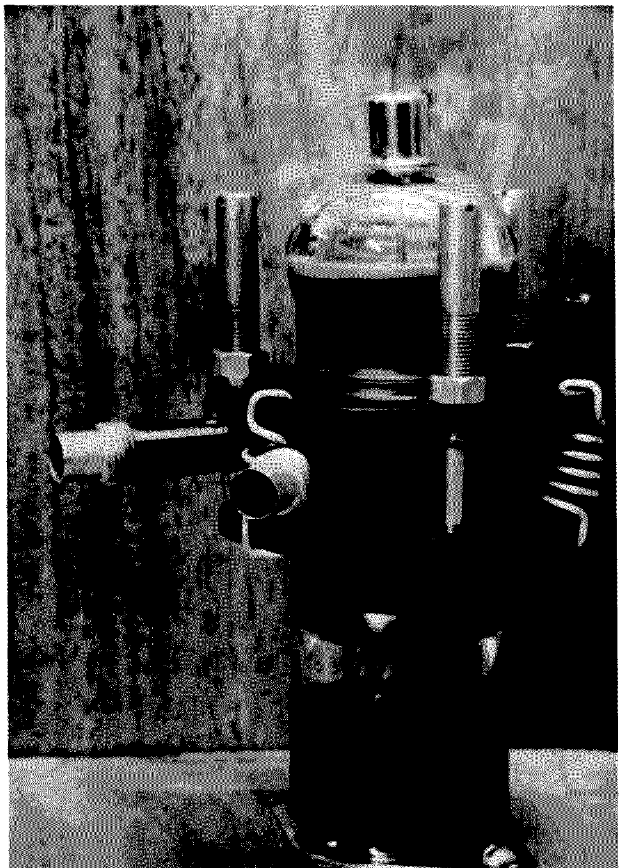
Ernie Franke WA2EWT
63 Hunting Lane
Goode VA 24556

Requiem for the Tube

This pleasing project is perfect for pentodes. It could be the last time you use them.

Around the shacks of most amateurs, one easily can find numerous antique oddball electron tubes. Most of them are too small to be made into lamps and too large for a tie clasp. But still, you want to dig out of those shoe boxes those nostalgic reminders of the good old days and do something with them which is both functional and attractive. Combining the beauty of nature's wood with the glass and metal of

High-power pentode.



Klystron.

"Family scene."

man in the form of bookends is a good example which should please even the most discerning XYL.

First, you need to visit your local lumber yard to purchase six-inch by one-inch-thick shelving. (Even though it is called 1", it measures only ¾" thick.) The material is then cut into two 6½" and two 4½" lengths. Then, using a bandsaw and chisel, a blind dovetail mortise is formed as shown in Fig. 1. Note that the dovetail is only ½" deep so that it doesn't even appear on the inside of the bookend. Each piece is then sanded, and holes are drilled for the tube sockets. The two pairs of wood pieces are then glued and nailed together before applying stain and varnish.

Next, a plate is attached to the bottom of the bookend using contact cement. This plate, which keeps the bookend from sliding, can be made of thin aluminum or wood veneer.

Finally, the tube sockets are screwed down into the drilled holes. For some large tubes such as the 4-400A variety, one might simply drill the 5 holes for the tube pins and then glue the tube in place.

There are several good candidates for old tubes: medium-power transmitting tubes such as the 4-125A, 1625, 807, and 24G; klystrons such as the 2K25, 2K26, and 417B, which look like miniature robots; lighthouse tubes such as the 2C39, 2C40, and 2C43; and acorn tubes such as the 954 through 959 series. A family

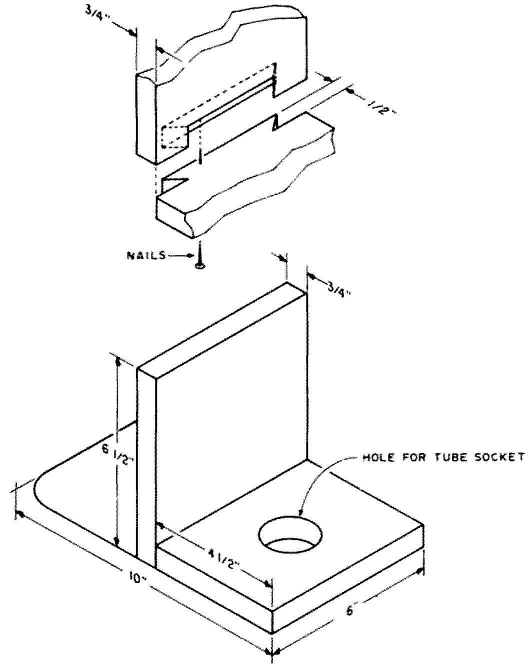


Fig. 1.

scene of tubes with two plate caps was formed on one set of bookends using the RK-34 (father), 2C26 (mother), and HY75A or HY114-B (baby) tubes. ■

✓See List of Advertisers on page 114

Ken Kolthoff K8AXH/7
1103 Carlson
Cheyenne WY 82009

New Orders for the R-109

Two bucks and ten minutes are all it takes to re-enlist a vintage receiver.

The R-108, R-109, and R-110 FM Army surplus receivers are readily available, very well constructed, and best of all, inexpensive. They are broadband FM sets covering 20 MHz to 55 MHz, depending on which set is used. These sets can be used with no conversion on 6- or 10-meter FM. They are fully tunable over their full range. I have had good results using them on various projects, including converting an R-109 to SSB for 10-meter use. The sets are very sensitive, using mostly one-volt filament tubes. All of the receivers I obtained came with a 24-volt plug-in power supply (PP-282) which draws about 4 Amps. This is an inconvenient voltage and current for mobile use or fixed operation when only 12 volts at low current is available.

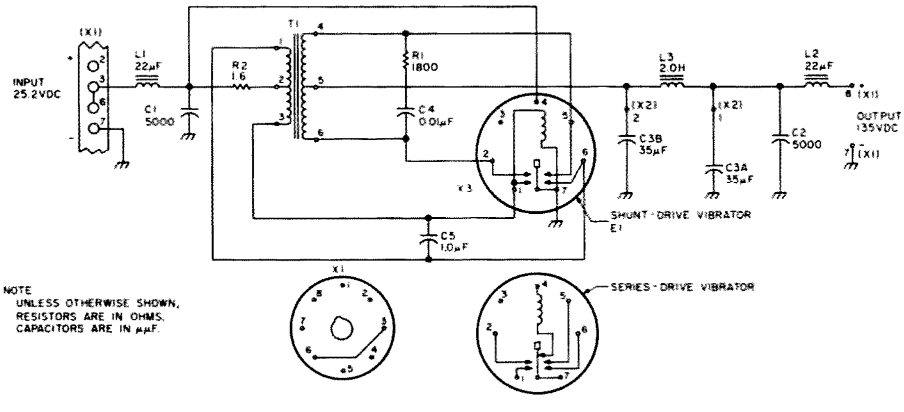


Fig. 1. Original power supply.

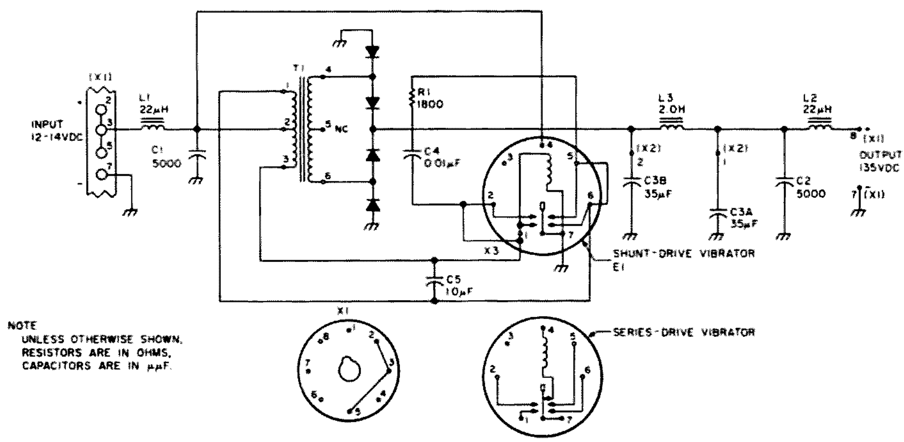


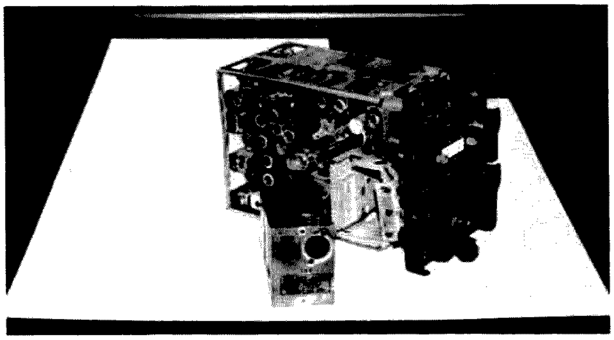
Fig. 2. Power supply modified for 12-14 volts dc.

Converting the 24-volt plug-in power supply to 12 volts is easy, quick, and inexpensive. The only part required is a Radio Shack 1-Amp, 400-volt bridge rectifier, catalog number 276–1173, at $1.89. This plus a little solder and wire is all that is needed. After the conversion, the unit draws only 1.5 Amps with 12-14 volts input.

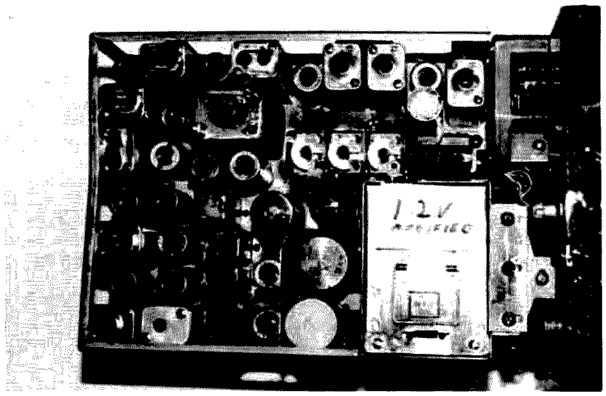
Power supply PP-282 is located in the receiver as a plug-in unit. Remove the receiver from the case by turning the six hand screws 45 degrees, then pulling the receiver out. Loosen the three retaining screws, slide the retaining bar over, and pull out the supply by the wire handle. Remove four screws to gain access to the supply. Two are on the lower back and one each on the top and bottom of the front. The bottom plate is then removed and the upper cover pulled off.

Under-the-chassis changes are covered first. The components are conveniently marked—thank you, US Army. Check each step as you proceed.

1) Solder a wire across the



R-109 10-meter FM receiver with internal power supply PP-282.



Bottom view with the modified power supply in place.

large 1.6-Ohm resistor, R2, shorting it out of the circuit.

2) Disconnect the three wires (2 yellow, 1 red) from terminals 4, 5, and 6 of power transformer T1.

3) Solder the yellow wire formerly on pin 4 of T1 to pin 6 on vibrator socket X3.

4) Solder the yellow wire formerly on pin 6 of T1 to pin 1 on socket X3.

5) Solder the 1-Amp, 400-volt bridge wires marked ac to terminals 4 and 6 on T1.

6) Solder the wire on the rectifier marked − (negative) to ground, pin 7 of socket X3.

7) Solder the red wire formerly on pin 5 of T1 to the + (positive) wire of the rectifer.

8) Turn the supply over and make two changes to power plug X1.

9) Move the bare wire from pin 6 of X1 to pin 5 of X1.

10) Solder a wire from pin 3 of X1 to pin 2 of X1.

11) Reinstall the power-supply cover and base plate and plug the unit into the receiver; tighten the retaining bar screws.

12) In the receiver, be sure that switch S1 is in the 6/12/24-volt position.

13) On the outside of the receiver, install a jumper wire into the Receiver Control plug between pins J and H. Leave the insulation on the center of the jumper because 100 volts lives there.

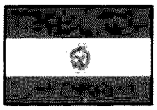
14) Put the receiver back into the case and apply 12-14 volts dc plus to pin B, negative to ground, pin C, on the power plug. That completes the conversion to 12-14 volts dc.■

Author's note: The power-supply conversion also works with the RT-70 6-meter FM transceiver.

73 INTERNATIONAL

Each month, 73 brings you ham-radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Jack Burnett.*



ARGENTINA

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Grupo Argentino de CW
Carlos Dihel 2025
1854 Longchamps
Buenos Aires
Argentina

Carlos Vianna Carneiro PY1CC
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THE LU3ZI SOUTH SHETLAND ISLANDS DXPEDITION

Pushed by the same marvelous impulse, the spirit of radio amateurs, the GACW (CW Argentine Group) sponsored the LU3ZI DXpedition to the South Shetland Islands, following the success of the previous LU7X (1979) and L8D/X (1982) expeditions to the States Islands for the *CQ* Worldwide CW Contest.

Aware of its responsibility, the GACW group operators for such DXpeditions are chosen from among the most reliable and skillful DX men in the group, and the splendid results in former and present DXpeditions show this to have been done, for operating capabilities, techniques, rules, and ethics were respected to the utmost.

An expedition to the Antarctic continent is extremely expensive, but the carefully planned project of Jorge F. Vrsalovich LU7XP was approved by the Direcion Nacional del Antarctico (Antarctic National Management), which rules all activities concerning the Antarctic continent in Argentina—the Instituto Antarctico Argentino (Argentine Antarctic Institute) in charge of all scientific investigations being one of its most important branches.

So, ultra-expensive transportation and logistical help were assured by the Argentine government; other problems were our responsibility!

Alberto LU1DZ started the job to get all that was missing: Oscar Rosity LU5DVO brought a rotator, Jorge Almoyraghi LU1EWL got a 3.5-kW generator from the Air Force, fuel and transportation to the docks were the job of Benjamin C. Cavallin LU9EMB, together with a second, 4.8-kW, generator. A 24-meter tower came from LU8DQ, a 3-element tribander Palombo beam was the contribution of Salvador Palombo LU3FG, and Carlos Rodriguez LU2DFX brought his own transceiver. Ronaldo Silva LU3EDZ checked and prepared the generators.

LU7XP, LU8DQ, and LU1DZ were to be the team, but almost-last-moment reasons stopped LU7XP and LU8DQ in Argentina. Ronaldo Silva LU3EDZ became the last-minute solution, and it now became a two-man team.

On board the ship, the *Bahia Paraiso*, Alberto and Ronaldo left Buenos Aires January 5, 1983, reaching Potter Cove on 25th of May Island eight days later, after a perfectly normal trip except for a storm in Drake's Passage which kept some in bed for 24 hours, seasick! From January 13 to 16, helicopters and boats landed all equipment to go to the scientific station, Teniente Jubany.

Ronaldo LU3EDZ, mechanics king, assembled generators, tower, and all during five long days of steady rain and snow and 40- to 60-kph winds with gusts to 90. A one-hour period was all the time Ronaldo could stand before getting shelter for rest again.

And then, at 1315Z January 16, CW on 20m, came the first contact, with W5RK, followed by CP7GM, LU9AX, and LU7XP. The first SSB QSO was with LU4US/mobile on January 28th, and then came LU2CM/mobile, LU1DBQ, LU4QD, and others.

During the seventh day of operation, after a 17-hour pileup, excessive earphone use caused Alberto LU1DZ trouble and fatigue, and the Teniente Jubany station physician had to stop CW operations for a while. Alberto then had a two-day SSB operation.

During a rest period, Daniel Vergani, chief botanist of the Mammalian Study Plan, took operators on a boat trip near Mariana Cove. The boat came upon four Jubarta whales, and Pablo Ljumberg, the diver managing the boat, happily got to not more than ten or fifteen meters from the whales. A possible emergency dive for all into frigid water was rather worrying!

An FT-101E transceiver and an FL-2100Z amplifier held up perfectly for the very hard 30-day operation, along with a Bencher key and an Autek manipulator with CMOS memory. SSB operations were great fun, too; discipline and respect for rules and ethics were perfectly obvious.

Lower bands, surprisingly, were very hard to operate, with QRN level close to S5, and S7 on 20 meters. This was true for weeks, which will give you an idea!

Openings to 3.5 and 7 MHz coincided with the best conditions on 14 MHz, so the question was: do a good job on the 20-meter band or try some problematic QSOs on lower bands? Conditions on 20 were good until 0430Z, but then trans-horizon radar came on, S9 plus 40! From daybreak to afternoon, until 2000Z, bands were closed, with few openings to 10 and 15 meters. Only 5 good openings on 28 MHz to Europe and North America, not so good to Africa and west Asia. Funny, during two nights on 15 meters and close to 0400Z, we could QSO Asia but signals didn't even move the S-meter! On 20 meters, from 0900Z to 1100Z, Asia was worked with the beam to the *west*! From 0230Z to 0500Z, the antenna beamed west of America presented strong echo troubles; the same to Oceania. A Tahiti signal came 30 dB over 9 no matter where the antenna was beamed!

The helicopter moved all equipment between beach and ship.

On 20 meters, an open road could be found by looking for band noise; between 330° and 30°, noise showed possibilities; due south was absolute silence.

For Alberto, a 160-meter lover, the happiest moments were when the 57 stations in South America, Central America, North America, and Europe all QSO'd 160 meters!

During rest periods, an automatic beacon operated CW at 28277, 30 Watts, dipole antenna, for ionospheric observations. It was exciting to hear the LU1UG 5-Watt beacon, vertical antenna, 28255 kHz, back in General Pico City, province of La Pampa, 124 meters above sea level (a 12BY7 and EL86).

Exciting, too, was the visit of the *Williwaw*, Willy de Rose's (VK9XR/MM) 9-meter little yacht, a traveller of all seas. He lunched with Alberto but had to leave quickly—a storm coming.

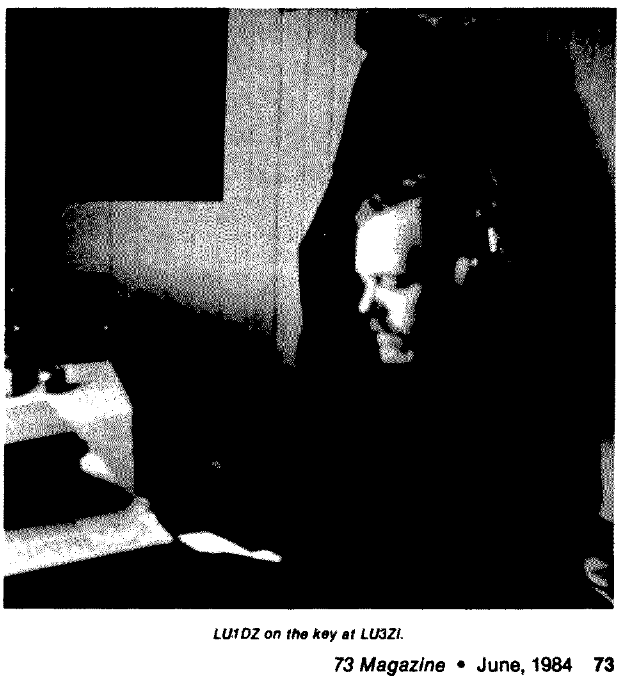
During the 28-day operation, 20,125 QSOs were made, 17,654 in CW and 2,471 SSB. Totals by bands: 160m—57, 80m—204, 40m—1,105, 20m—8,916, 15m—6,414, and 10m—3,429. Six continents and 123 countries were worked. *THE QSO* was on 160m with K7PQS/MM sailing the North Pacific off the Alaska coast! A 599 RST and even a short chat was possible!

A Palombo tribander was used for high bands; on 40m, 80m, and 160m an inverted V did well, 80m with the V at 15 meters high, and the others with the V 13 meters high.

The Teniente Jubany generator powered the station most of the time; our own generators were used only when power stopped from the base, from 0200Z to 0900Z.

During pileups, as many as 186 QSOs were realized in one hour, but after we got to 12,000 QSOs, pileups decreased and the rate came down to 120 QSOs per hour, tops.

Ending time came, and in a hurry all was disassembled because the ship was near the beach and all equipment had to be packed and taken aboard, in spite of strong winds and night coming. But anxiety to go home brought new strength to Alberto and Ronaldo, and in about ten



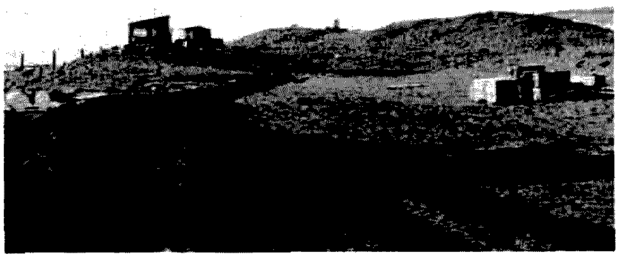
LU1DZ on the key at LU3ZI.

hours they were aboard, going back home after their 53-day adventure, a marvelous experience, and once again an expedition proved GACW's capabilities in such cases with first-class results.

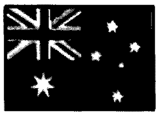
Our special gratitude to Lieutenant Colonel Luis Fontana of the DNA, to all institutions who helped us, to friends and members of the GACW, and to all operators who helped us with their patience, understanding, and support, thus making the LU3ZI South Shetland Islands DXpedition a success to be remembered.

QSLs were to be delivered to GACW, Carlos Dihel 2025, 1854 Longchamps, Buenos Aires, Argentina—an address well known to DXers.

Landing beach, 600 meters from the QTH.



QTH site at the Teniente Jubany station.



AUSTRALIA

J. E. Joyce VK3YJ
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Australia

There are many contests on the amateur-radio bands throughout the year and Australia has its fair share, with most of us entering these contests, either seriously or in a lighthearted manner.

However, there is one contest in Australia that is never entered into with a flippant or lighthearted manner because of what it represents.

I am speaking, of course, of our Remembrance Day Contest, held on the closest weekend to August 15 each year to honor the Australian amateurs who lost their lives in WWII. This date, August 15, has special significance for us as it was on that day, in 1945, that all WWII hostilities ceased in the Pacific area.

The trophy itself is of typical amateur-radio-oriented design, featuring a yagi antenna mounted on a tower. This trophy is perpetual, being awarded each year to the winning division of the WIA (Wireless Institute of Australia).

As this is a local competition, with points being scored only for contacts between Australian call areas plus New Zealand (e.g., VK1 to VKØ and ZL) on all amateur bands, it does create a lot of friendly rivalry between each state's amateurs, with the winning state or division having the honor of keeping the trophy at their headquarters until they hand it over to the next winning division—but keeping it, of course, if they win it again. Their term as trophy holder is not forgotten as each winner has its name engraved on a metal shield attached to the base of the trophy.

The reigning champions of the RD Contest are the South Australians (VK5), with their latest win in 1963 making it ten wins out of the last twelve years. A remarkable achievement considering that they are competing against a much larger amateur population in the eastern states, e.g., VK2 or VK3.

We have, over recent years, had New Zealanders also entering into this competition with a lot of interest but, as yet, no luck in winning this trophy. Also in this category are the P29 (ex-VK9 Papua New Guinea) stations.

Certificates are also awarded to the top-scoring stations in each division, with the winning division being decided by the formula: Total points times weighting factor, divided by total divisional licenses.

Each division is divided as follows:

- VK1—Australian Capital Territories
- VK2—New South Wales (plus Norfolk Island, Lord Howe Island)
- VK3—Victoria (and remainder of Australian Antarctica)
- VK4—Queensland (and offshore islands—Willis and Thursday)
- VK5—South Australia (and Northern Territory—VK8)
- VK6—West Australia (and offshore islands including Cocos, Keeling, Christmas, Heard, and part of Australian Antarctica)
- VK7—Tasmania (and Macquarie Island)

The VKØ is by far the most sought after, as a contact with them gives you the greatest single number of points.

In recent years it has been the policy of the WIA to have some notable person open this contest. So far, we have had three of our Prime Ministers honoring us with their presence, the latest one being the Rt. Hon. Malcolm Fraser, in 1976. We also have had two Ministers of Communication and several State Governors, with Mr. Richard E. Butler, Dy. Sec. Gen., ITU, doing honors for the occasion in 1979, showing that members of our government and other notable dignitaries hold this contest, and what it stands for, in the highest esteem.

Listening for this contest, you won't find the usual QRM all over the bands that we hear with some of the larger contests, for we have only approximately 14,000 licensed amateurs in Australia, with a percentage of these restricted to VHF and above. Also, not all of the remaining amateurs are interested in contests, so it makes it a real relaxed style of operating, with time to have a quick chat with old friends or overseas stations looking for a short QSO or new country—particularly in our early hours of the morning when any contact to keep you awake is very welcome.

K CALLS

The K call is a special license introduced in 1980 to cater to those amateurs who hold two licenses, namely the Novice and the Limited. There has been an abnormality with this class of license which our DOC (Department of Communications) has rectified this year.

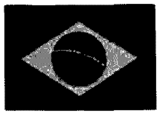
Previously, the problem had been that as a Limited license-holder able to operate on all bands above 50 MHz, you did not have to pass any CW test, giving you a very technically-minded person who has passed the equivalent of our full-call license in the theory aspect but has failed, or has not tried, the test on CW at 10 wpm, send and receive.

The Novice license gives you access to the HF bands of 80, 15, and 10 meters, but to pass this test, you need CW at 5 wpm, send and receive, so it is possible for an amateur here to hold two licenses, one for his Novice call starting with, e.g., VK3 -N, -V, or -P, and his Limited starting with VK3 -X, -Y, or -Z. The result was much confusion on the bands.

This caused our DOC to create the K call, giving the holder of both licenses the option of using (but not requiring) one callsign only, starting with a K, e.g., VK3K- -.

The problem was that as a Novice he could operate on CW, but as a Limited he could not operate CW on the higher frequencies. The DOC has now granted the holders of this special call the privilege of CW operations above 50 MHz.

So, if you hear a VK3K operating on the higher frequencies using CW, please slow down, as his CW speed may be only 5 wpm. Some, with their keyboards, will be able to operate at higher speeds, but as our exam test is with a hand key, their expertise on the keyboard is to no avail until they pass the hand-sent test to gain their full-call license.



BRAZIL

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NEW PREFIXES IN BRAZIL

Since June, 1975, Brazilian states have had a special prefix so that an immediate identification was possible for radio amateurs in Brazil as soon as the call was given. Brazil has nine regions and 26 states and territories. The PY prefix was changed to PP, PT, PR, PS, PW, PV, or PU in certain regions, according to the number of states in each.

To identify Class C radio amateurs (allowed only phone mode on 80, 160, VHF and UHF, and CW mode on all bands except 20 meters), three-letter suffixes starting with W, X, and Y were in all prefixes now in use.

Also with the PYØ prefix for Brazilian ocean islands and DXCC "countries" (Fernando de Noronha, Trindade, and S. Peter/S. Paul), this sure was a hit with prefix-hunters all over the world, delighted with new possibilities.

But what couldn't be imagined by Brazilian authorities was the tremendous run to Class C, since VHF facilities and conveniences and a "no-code" license were a very strong appeal to former CBers and others.

VHF being their only goal, almost no one cared for HF restrictions, and so VHF operators came by the thousands, thus "blowing up" the system by using up all "three-letter" combinations started by W, X, and Y! So a new law has been published in Brazil, modifying Class C prefixes and creating a new curiosity for prefix-hunters.

From February 13, 1984, Class A and B radio amateurs (except for Amapa Territory—PU8...) will continue with their actual call letters, prefixes, regions, and suffixes as before; Class A and B radio amateurs in Amapa territory will be PY8, like in Para State.

Important modifications come to Class C operators now all under PU prefixes from 1 to 9, according to the region they belong to. No more PP, PT, or PY, but only as follows:

- 1 Region—PU1—Rio de Janeiro and Espirito Santo States
- 2 Region—PU2—Sao Paulo, Goias, and Federal District
- 3 Region—PU3—Rio Grande do Sul State
- 4 Region—PU4—Minas Gerais State
- 5 Region—PU5—Parana and Santa Catarina States
- 6 Region—PU6—Bahia and Sergipe States
- 7 Region—PU7—Pernambuco, Ala-

goas, Paraiba, Rio Grande do Norte, and Ceara States

- 8 Region—PU5—Para, Amazonas, Maranhao, Piaui, Acre, Rondonia, and Amapa States, and Roraima Territory
- 9 Region—PU9—Mato Grosso and Mato Grosao do Sul States; PU0—Ocean Islands Fernando de Noronha, Trindade, S. Peter/S. Paul Islands

So what's going to happen from now on? Well, NEW Class C radio amateurs will have their calls according to PU prefix determinations; already prefixed radio amateurs a few at a time will be called to DENTEL (the Brazilian Telecommunications National Department) and will have their prefixes changed according to the new law. This will take some time, for Class C operations in Brazil are a great majority spread all over our big country; this will mean trouble for our authorities.

Due to this new law, the PU8BI operation from Macapa, in Amapa, took place under a ZY8BI call (QSL information to PY8BI as announced), a last-minute change although the *DX News* sheet and others had spread the word.

CW operators will have a better chance to QSO the new PU Class C since regulations allow them almost all CW bands except 20 meters!

de PY1CC

AMATEURS VISIT PRESIDENT FIGUEIREDO

Directors of the Brazilian Amateur Radio League (LABRE) were kindly received in the Palace by the President of Brazil, General Joao Baptista Figueiredo. Taking the opportunity, they invited him to head the first meeting of the 4th Brazilian Convention held in the city of Brasilia to celebrate the 50th anniversary of the League. The audience lasted about thirty-five minutes, and the President asked questions about amateur-radio activities in Brazil. Finishing the audience, the President surprised everybody when he said that he also expects to be an operator after his time as President. In fifty years of the League, it was the first time that a group of operators was received by a Brazilian President.

THE DEATH OF W4KCF

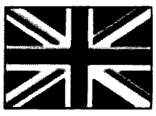
With deep regret, the *Bulletin* edited by the Brazilian League recorded the passing of Victor C. Clark W4KFC, President of the American Radio Relay League. The death of Vic brought a painful sense of loss to all amateurs in the world.

MEDITATION

Inge Tobias de Aguiar PY2JY is well known as the controller of the Brazilian Young Ladies Net, meeting every Wednesday on 14.248 MHz from 1900 to 2100 UTC. One night, about two years ago, while in a hospital after a surgical operation, the consequences of which were not then known, she wrote on a piece of paper this meditation, which I will translate, trying to give the same meaning as it had in Portuguese.

My God, if I die now, I will die happy
Because I knew friendship,
Kindness, collaboration, and altruism.
Since my first day as an amateur,
Up to now, nobody disappointed me.
From South to North, from West to East,
I have friends and when they hear me,
They become happy to meet me again.
A lot of them, I will never know personally.
Only through their QSLs or letters.
Hearing their voices
I'm happy when I can recognize
A few of them whom I had known personally
In someplace in the world.
They received me like a sister,
And we enjoyed ourselves with happiness,
Like very old good friends.
When I participated in any emergency operation,
I never stayed alone.
Always I had friends who helped me.
I could understand that amateur-radio activity
Is always friends working together.
When I needed help,
I received it immediately.
Nice friends!
To be an amateur is to live with happiness.
Happiness to have so many friends
On whom you can count always.
Happiness to have the chance to help someone with difficulties.
Sadness when you need to transmit bad news.
Happiness to be acquainted to another friend.
Happiness to meet someone again.
Happiness to have the chance to help impartially.
And I am happy because I am sure I performed my duty.

de PY1APS



GREAT BRITAIN

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THE UK SCENE

I wonder at the continuing ingenuity of equipment designers to produce more and more exciting products that do not really offer any significant improvements in performance in relation to their fundamental job (or principal function)!

The prime example of this must be in the ongoing development of radio receivers for the enthusiastic listener (rather than the hi-fi enthusiast or casual observer). There do not seem to have been any significant strides in performance recently. (Performance, that is, measured by way of sensitivity, signal-to-noise ratio, intermodulation distortion, or whatever.) And yet the new models continue to hit the streets and continue to persuade large numbers of listeners to part with large quantities of hard-earned cash. The most recent model is the Sony ICF 7600D synthesized full-coverage shortwave receiver (with Band 2 FM coverage just in case you get fed up with the QRN and QSB).

I have had a Sony ICF 2001 for about 18 months since I acquired it for a trip to Nigeria. Whilst in that country I wanted, obviously, to be able to tune in to BBC World Service (if only to remind myself that home was still there). I also needed to make some subjective assessments of shortwave propagation from up country to Lagos. The ICF 2001 was a useful piece of kit, particularly in an area with a crowded shortwave spectrum. Being able to find readily a particular transmission simply by keying its frequency was a positive bonus.

That was the good news—the bad was the size and weight of the unit (although much smaller than a "conventional" shortwave receiver) and its voracious appetite for D cells which I had to take in quantity to avoid being dead in the bush.

The new model, though, comes very close to the shirt- or vest-pocket shortwave radio (of reasonable performance, that is). Although only small enough to fit into a poacher's pocket, it will fit easily into a corner of my briefcase. This means I can carry it (and its AA-size dry cells) on my many business trips. And that was the justification for paying about $250. Now when I am away on business, I can still listen to the world.

It never ceases to amaze me just how much traffic there still is on the shortwave bands. Satellites and computers and other hi-tech gadgetry are OK in their place, but, seemingly, there is still no substitute for tried and tested methods.

A recent bringing together of computers and shortwave radio may be of interest to aeronautically-minded readers. A number of utility stations around the world transmit Volmet messages giving plain-language weather information for principal airports. The broadcasts, including information such as cloud base, visibility, current weather, etc., are intended primarily for aircrew. The Royal Air Force (RAF) is responsible for some Volmet transmissions in the UK. On 4.720 MHz they now use a computer-synthesized voice. The station seems to broadcast all day.

UK CONTESTS

The Radio Society of Great Britain (RSGB) organizes and coordinates a great many contests throughout each year. Many of these are on the VHF bands and above (70 MHz, 144 MHz, 432 MHz, 1296 MHz, and higher frequencies being represented) and of little interest, therefore, to non-European readers. There are, however, a number of HF contests with an emphasis on working UK stations. Those following the publication date of this issue of *73* include:

• 2-3 June	HF National Field Day
• 23-24 June	Summer 1.8 MHz
• 15 July	QRP Field Day
• 1-2 September	SSB Field Day
• 7 October	21-28 MHz phone
• 21 October	21 MHz CW
• 10-11 November	2nd 1.8 MHz
• 12 November, 20 November, 28 November, 6 December, and 14 December	28 MHz Cumulative

In all cases, UK stations will be looking for as many DX multipliers as they can find. DX stations will find these dates useful for increasing their log entries of all UK prefixes.

ISRAEL

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In the last few columns, I've dealt with specific areas of amateur radio in Israel. In the meantime, a number of news items have accumulated, so the time has come to take care of these odds and ends.

CONTESTS

The Israel Amateur Radio Club Contest Committee has announced three upcoming competitions. The first two are on a national basis—the Spring Contest on Israel Independence Day, May 7, on 160, 80, and 40 meters only, and a VHF-UHF test to be held in the summer. Of interest to readers of this column is the long-awaited Israel-International DX Contest that is planned for mid-October. When details become available, they will be rushed to the international amateur press.

THE JERUSALEM AWARD

The following are the final requirements for the coveted Jerusalem Award: Ten different Israeli stations must be worked, including no less than seven Jerusalem staions. All modes and bands are permissible, and the contacts must have been made since January 1, 1983. No QSLs are necessary—just a log of the contacts, verified by two other licensed amateurs. This is to be sent along with eight IRCs to the award manager, Dr. Milt Gordon 4X8AA, PO Box 4079, Jerusalem, Israel.

The rules for the two awards of the Israel Amateur Radio Club remain unchanged and are to be found in this column in the August, 1983, issue of *73*.

STS-9

Quite a bit of interest was created here by the flight of the STS-9 space shuttle with Dr. Owen Garriott W5LFL operating on board. A few diehards assembled the antennas specified by AMSAT and kept themselves up-to-date on orbit and frequency information. To the best of my knowledge, the only contact with the *Columbia* in our region was made by our neighbor, His Majesty King Hussein JY1. In the Royal Palace, an American televison crew recorded this historic QSO, which later was televised all around the world. At the time of this contact, amateurs in the region who were monitoring W5LFL's frequency heard nothing, pointing to the fact that this contact waa a prearranged sked.

NEW REPEATER FOR TEL AVIV

Tel Aviv has become the recipient of a brand-new, two-meter repeater to replace the old one, long suffering from problems of intermod and low sensitivity. In a ceremony in the Motorola Israel offices, Yair 4X4GH, Avner 4X4GE, and David 4X4WA, representing Motorola, presented the repeater to representatives of the IARC. Since then, Aharon 4Z4AG has been testing and adjusting the machine, and by the time this is in print, it should be on the air on R7, 145.775/.175 MHz.

Yair Yosefi 4X4GH, speaking for Motorola, said that his firm views the amateur public as a technical resource in the field of electronics, and thus Motorola continues to aid the radio amateurs of Israel in developing a national repeater network. In reply, IARC president Aharon Kirschner 4X4AT gave recognition to the fact that the entire chain of IARC repeaters has been donated by Motorola Israel. Aharon praised Mr. Yosefi, who had done everything in his ability to aid the IARC. After the speeches were over, glasses were raised to toast "the repeaters that are on the way." The meeting was concluded with a guided tour of the company's labs, conducted by 4X4GE.

MINISTRY OF COMMUNICATIONS NEWS

An ongoing dialogue, once every three months, is being held with representatives of the Ministry of Communications. The following items have been concluded up to this date.

Every planned change in amateur licensing will be made known to the IARC executive before it is made public knowledge. The chart of allotted frequencies and powers will be deliberated upon by a joint group from the Ministry and the IARC. The possibility of placing IARC re-

peaters in Ministry of Communications sites will be examined.

The process of licensing visiting amateurs from abroad is to be simplified. And the physical size of the amateur license is to be reduced from certificate to wallet size.

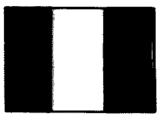
CB IN ISRAEL?

A committee from the Ministry is to be set up to examine the establishment of a code-free license according to the following guidelines: The license will be granted to those passing an exam covering conditions of the license, voice operating procedures, and safety precautions. A single crystal-controlled frequency in the 27-MHz region will be allotted, and both input and effective radiated power will be limited.

Ehud "Ed" Zager 4Z4UR has compiled a 12-page booklet dealing with lightning and communications systems. The book, distributed free of charge to IARC members, covers everything you ever wanted to know about lightning, the damages it can cause, and how to protect your station effectively from its ravages. Who knows? Maybe Ed can be convinced to put out an English edition!

Not long ago, I received an unexpected but welcome visitor, Major George Mixom N4IOM, who recently came over to these parts to serve with the Multinational Forces in the Sinai peninsula observing the Israel-Egypt peace treaty. George, a reader of this column, was on his way back to Egypt after picking up his Israeli reciprocal license in Tel Aviv and decided to drop in and say hello. There is not yet an Egyptian-American reciprocal licensing agreement, so George doesn't know if he'll be able to get permission to operate portable SU. If he does, I'm sure he'll have some big pileups to contend with.

In conclusion, I'd like to give you again the present procedure for obtaining a reciprocal license during your visit to Israel. You appear in person with your valid amateur license (not a photocopy) at the office of the Ministry of Communications, on the tenth floor of the Shalom Tower on Ahad Ha'am Street, downtown Tel Aviv's highest building. A reciprocal permit will be issued on the spot free of charge. Office hours are from 9:00 am to 1:00 pm, Sunday through Thursday, and the phone number is (03)-810278.



ITALY

Mario Ambrosi I2MQP
Via Stradella, 13
20129 Milano
Italy

The January issue of *Radio Rivista* (the Italian League magazine) dedicates one page to the awards sponsored by *73* with the reproduction of three of the awards. On the opposite page there is a photo of the Italian Islands Award. It's a very nice one and we have been writing about it to call your attention to it. (See the January column.)

In the same magazine, the cover photo and 10 pages cover usage of the personal computer in the radio shack. Particular attention is given to the Commodore 64 that is becoming very popular in Italy (we are waiting for the first copies of *RUN*) and to some locally-built interfaces.

Lots of excitement between Italian 2-meter users for the activity of W5LFL during the first days of December. Owen Garriott was heard with very strong signals on the 5th and the 7th of December and was worked by a few of the 2-meter big guns. It was not necessary, in any case, to have anything special to read him; it was enough to turn on a hand-held transceiver, but it was not easy to work him due to the huge number of people calling him.

I1NRF and I5FBP have had confirmation of contacts; more are expected.

NEW FREQUENCIES IN ITALY

The Italian Ministry of Telecommunications has given written confirmation of the new frequencies assigned to Italian operators.

- 1830-1850 kHz with a maximum output power of 100 W. For the area of Sicily, the upper limit is 1845.
- 18068-18168 kHz. For the moment, only on a secondary priority basis; awaiting the reallocation of the existing services to other frequencies to become primary.
- 24890-24990 kHz. Same situation as above.
- 1296-1298 MHz with a maximum ERP of 50 W.
- 1267-1270 MHz only for satellite service, to be assigned on a personal basis upon request.
- 10100-10150 kHz. We will be authorized to use only 10 kHz on this band. The Italian League has been requested to investigate and report what is the best part of these frequencies. The choice will be very easy as we will only have to find where the interference is lowest. In fact, Radio Moscow is received at 10115 with 9+40 signals and Arabian broadcasting uses 10120 with 9+20 reports.

MOBILE SERVICE, REPEATERS

The Ministry of Telecommunications has agreed to authorize the local operators to work mobile on 144 MHz and up with a maximum power of 10 W; no clarification is given as to whether this is input or output.

This is an important point as it recognizes the mobile service, and possibly it can be a first step to get the same kind of authorization also on HF.

The same day, the authorities recognized the existence of repeaters on the 2-meter band. Rules will be issued on this matter in a short time.

80 METERS

The 80-meter band is still a subject of dispute between the League and the Postal Administration. We can now see the possibility of finding a solution to be able to use all the band, but it will take several months to reach the final agreement.

A first step towards it is the acceptance from the Administration not to take too strong actions against hams found out of the authorized small portions of frequencies. From now on, the "bandits" will receive only a written note of the violation instead of having the license suspended for one month and a fine. All the above is a clear indication of a different attitude towards tha amateur community, and this is mainly due to the kind but firm approach taken by the Italian League. Let's hope it will continue this way.

FIRST CA RTTY

The first county RTTY award has been given to Joe I0AOF from Rome. He had to contact 12,000 US stations to be able to reach the 500 different counties. In the meantime, he has also worked 192 countries and is now trying to reach the 200 level; that is quite an achievement for a RTTYer! He is always looking for the States, so if you hear him, give a call.

* * * * *

Maybe you will be interested to know that in our country you can install a television station and broadcast porno films all through the day and you will get into no troubles.

LIBERIA

Brother Donard Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
PO Box 1005
Monrovia
Republic of Liberia

Antenna parties! Amateurs here in Liberia love to go to antenna parties!

Saturday night I was talking to one of my friends on two meters. He had spent most of the day on Embassy Hill helping to put up a three-band Cushcraft. He apologized because I was not invited for the occasion. As a matter of fact, it was less than a year ago that I had helped put up the same antenna at another location. Evidently, in this instance, they had a tower on the roof of a multi-storied building and had found it necessary to build a working platform at the base of the tower. The size of the platform limited the number of "experts" that could be accommodated. I felt left out but understood that it really could not be helped. As it worked out, the antenna didn't work.

It was too late in the day to do anything more, so everyone went home and we spent the evening on two meters advising the group on what they should do the next day. I made the brilliant suggestion that they make some ohmmeter checks before they take down the whole antenna.

"There is really no reason why the thing shouldn't work."

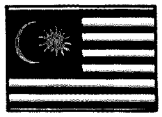
After a hard night, the group reassembled the next day, which was Sunday, and began to run tests. It turned out that the balun was shorted so they took it out and connected the coax directly to the driven element. After a few loops were put into the feedline at the upper end, the swr was almost one to one.

I mentioned above that we had put up the same antenna for another amateur less than a year previously. He was a beginner and had built his first kit, a Hot Water one zero one. That didn't work either. Just about the time we finished troubleshooting the rig and had him on the air, he was given another assignment and sent to another country. That is a chronic situation in these parts, at least so it seems.

In my experience, amateurs like to help each other, but over here in Liberia I think that this spirit is "special." The reason is, of course, that there are so few of us and the fact that parts and service are scarce. In spite of poor mail service, we manage to move radios and parts up and down the country as the necessity arises. It may take a couple of weeks or a month, but patience is something that one learns very rapidly.

We do have a good repeater and that gives us communication with amateurs who have two-meter equipment, but more importantly we have the West African Nat which meets every Sunday morning at 0800 Zulu. Most of the counties of Liberia check in on Sunday morning so we are able to pass messages. The net meets daily at 0700, but not as many of the stations are able to check in on the daily schedule.

We don't miss an antenna party if we can help it.



MALAYSIA

Mohammed Salleh 9M6MO
Radio & TV Malaysia
Mile 1½ Tuaran Road
Kota Kinabalu
Sabah
East Malaysia

MOUNT KINABALU EXPEDITION

We started off from Kota Kinabalu at about 1500 local time (0700 UTC) on January 13, arriving at Kinabalu National Park at 1700. The National Park is about 48 miles (77 km) from Kota Kinabalu. There were ten of us in the group—I was the only amateur-radio operator. Eight of us managed to get beds in the hostel. (One of my friends and I had to sleep in our individual cars.) The park is 5000' (1524 meters) above sea level. The night was quite cold and it was raining.

The next day at 0700 we reported at the park headquarters located a few hundred yards from the hostel. After having coffee at the park's canteen, we started off in a hired vehicle (small truck) to the power station three miles away. From the power station, we started walking up. We had one guide and we did not hire any porter to carry our load. Every one of us carried a haversack. I had to carry a 2-meter mobile transceiver, one 12-volt, 12-Amp/hour motorcycle battery, and an antenna (Slim Jim). The antenna is a home-brew job from *Practical Wireless*, for April, 1978, F. C. Judd G2BCX.

When we started, Sylvester, one of my friends in the group, decided to help me carry the battery and the 2-meter rig. This was really appreciated because we were to climb about four miles before stopping over for the night at the Panar Laban shelter at 11,000 feet (3,000 meters). All along the way the temperature was comfortable and cool. We took some pictures; we were very tired as we got closer to Panar Laban. I felt a little short of breath and had a slight headache at the high altitude.

Some of the boys reached Panar Laban at 1230, but myself and three others arrived at 1500. It was a relief to see Panar Laban!

After getting the bed and the sleeping bag ready, I set up the equipment (FDK 800D, 2-meter FM) with the antenna between two rocks, almost on the ground. I started calling CQ at about 0500 UTC with one Watt of power, FM. Not long after the call, I heard VS5HG from Bandar Seri Begawan, Brunei; he came in 5/7. He was running 25 Watts into a groundplane. Brunei is about 320 km away. And after about 20 minutes of the QSO, during a break, I heard another station talking to VS5HG.

The other station was a bit weak with a lot of noise. Later on, I could identify that it was Gerald VS5GA. So I asked VS5HG to tell Gerald that I could hear him weakly. Later on, I understood that Gerald could hear me, so I increased power to 5 Watts. So, with me running 5 Watts and Gerald running 25 Watts, we managed a long

Continued on page 122

James B. Johnston K6APW
1026 Peralta Avenue
Albany CA 94706

Try Quality Code

Using this Mod III update is much simpler than saying its title trenty times.

You TRS-80 Model III users who didn't "patch" the fine keyboard program written by Louis Graue K8TT (*73*, July, 1982) have possibly missed a nice station addition. I did not like the messy screen that the original patch-up left me, so this insert was written. Lou has graciously tested this and a previous version and reports this one runs fine on his Model I also.

The two models have partially different ROMs and the calls used to decode the miscellaneous keys read in 3840H memory location give invalid data for the Model III. This substitution instead continues the software decode.

To keep the video in sync with the sending program, unshifted arrows other than backspace are ignored. Attempts to use expanded video by loading 07H in line 3570 (right arrow) gave different, though equally fatal, problems for both models. The 10H in the listing, when shifted, will give an "extra" space bar. Sending "clear" directly to video memory bypasses a ROM routine that actually clears the screen. I retained it as is since it is not destructive.

If your editor doesn't renumber on line collision, use a smaller step for your insertion and renumber from the top when finished. The procedure—delete lines 3260 through 3550 and insert the listing shown here.

If you have included the comment lines, the renumbering will give an easy-to-read two-hundred offset to SCHR and following lines. Lou and I both experienced symbol table overflow when assembling—not enough memory. After saving the source file, eliminate as many comments or comment lines as necessary to free memory.

New Information

Lou passed along from John Meade W2XS support of BT, AA, AR, and SK. Change the data in the following lines:

Line	Character	Key
2450	BT = 0D1H	-
2580	AA = 0E5H	:
2590	AR = 0CAH	;
2610	SK = 85H	=

I key my solid-state transceiver directly with one 2N2222 driven through a 2.2k-Ohm base resistor by substituting a two (02H) for the zero in lines 220, 1290, 1590, 1770, and 1960 of the original listing. This change gives a true zero out instead of 0.4 volts.

Good luck and I hope to hear some Model III keyboards soon.■

Program listing.

```
Delete lines 326Ø through 355Ø:

Insert:

326Ø  ;KEYSCN insert for K8TT CW KEYBOARD of
327Ø  ;73 MAGAZINE  July 1982
328Ø  ;TRS-8Ø MOD I and III - K6APW  March 1983
329Ø  ;
33ØØ          JR     C,SCHR     ;@ through Z (no shift)
331Ø          SUB    7ØH        ;numbers?
332Ø          JR     NC,COMPUT  ;go if not numbers
333Ø          ADD    A,4ØH
334Ø          CP     3CH        ;Ø through 9 :;,
335Ø          JR     C,SHBIT
336Ø          XOR    1ØH        ;make -./
337Ø  SHBIT   RRC    B          ;left (both MOD I)
338Ø          JR     C,SHIFT
339Ø          RRC    B          ;right
34ØØ          JR     NC,SCHR
341Ø  SHIFT   XOR    1ØH        ;make uppers
342Ø          JR     SCHR
343Ø  COMPUT  CP     Ø7H
344Ø          JR     Z,SPACE
345Ø          CP     Ø5H
346Ø          JR     Z,LF
347Ø          JR     NC,RT
348Ø          CP     Ø3H
349Ø          JR     Z,UP
35ØØ          JR     NC,DN
351Ø          CP     Ø1H
352Ø          JR     Z,CLR
353Ø          JR     NC,BK
354Ø          JR     SCHR       ;no ENTER, already NUL
355Ø  LF      LD     A,Ø8H
356Ø          JR     SCHR       ;go, shifted or not
357Ø  RT      LD     A,1ØH      ;not Ø9, see text
358Ø          JR     ARROW
359Ø  UP      LD     A,ØBH      ;not 5BH
36ØØ          JR     ARROW
361Ø  DN      LD     A,ØAH
362Ø  ARROW   RRC    B
363Ø          JR     C,SH
364Ø          RRC    B
365Ø          JR     C,SH
366Ø          LD     A,Ø        ;keep video sync
367Ø          JR     SCHR
368Ø  SH      ADD    A,1ØH      ;shift them
369Ø          JR     SCHR
37ØØ  CLR     LD     A,1FH
371Ø          JR     SCHR
372Ø  BK      LD     A,Ø1H
373Ø          JR     SCHR
374Ø  SPACE   LD     A,2ØH
375Ø  ;
```

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½"×11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye," and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

Need schematic diagram for the Spectronics DD-1 digital frequency display which I'm using with a Yaesu FT-101E. Will make copy and return. Please send to:

Jack Duncan K0CNM
RFD 3, Crestview Drive
Denison IA 51442

Help! I now own a working NC-109 general-coverage receiver. I need information about it so that when it no longer works, I can find out why. (Also, I may want to perform modifications to it.)

Also, I have been having a terrible time tryig to connect a Western Electric #1035C3A-type touchtone™ pad to a 500-type telephone set. Any help at all will be greatly appreciated.

Andrew W. Gaunt
52½ Washington Street
Newburyport MA 01950

Does anyone have a way to convert a TI 99/4a computer into a code keyboard?

B. F. Knoll KA8TIO
707 N. Wisner
Jackson MI 49202

I need an operating/service manual for a Javelin model 3100 (North American Video Corp.) closed-circuit TV camera.

Larry Steele K0UKO
5060 Chickweed Dr.
Colorado Springs CO 80917

I need any information, manuals, or schematics for the Analab Type 1100 oscilloscope with Type M 16 plug-in.

W. A. (Walt) Eddy K5QDD
111 N. Maddox
Dumas TX 79029

I am desperately looking for a few of the miniature CB walkie-talkies made by Data Magnetics Corporation called the Pocket Com. They were two channel 100-mW units, model number XB-100.

I am also interested in old CB equipment of all types and conditions. Please send info and prices.

Dennis R. Starks
Box 95
Cross Timbers MO 65634

Please, where can I find a manual for a solid-state OS-8G scope?

Russ Lawson K1MOU
124 S. Grand Street
W. Suffield CT 06093
(203)-668-2871

I am looking for schematics and/or operator's manuals for the Regency Monitoradio 4-band receiver (model WT4) and the Johnson Viking Adventurer transmitter (no model no.). I also need crystals for the xmitter for any of the Novice bands. I will pay reasonable costs.

Carl Arndt
Box 215
Andale KS 67001

I need the schematic (only) for a Gonset model G-77 mobile transmitter. Also, I need a schematic (and possibly manual) for a Calico (California Instruments Co.) model 8000 digital voltmeter. I will pay reasonable copying costs and postage. Thank you.

W. Richmond WD4CPQ
521 Rawlings St.
Louisville KY 40217

A circuit diagram is needed for a vintage receiver (about 1940) built by the Mackay Co. for maritime communications, with regenerative control, Model 128AX. It covers .15 kHz to 640 kHz in four bands. Any help will be appreciated.

Ken Hunt WB7OVU
6519 Valhalla
Klamath Falls OR 97601

Need schematic diagram and manuals for (1) Lafayette Model HA-600A solid-state 5-band receiver, and (2) Kantronics Model 80-40B direct-conversion CW receiver. Will pay copying costs and postage.

M. K. Ellsisen W1KJF
128 Morningside Drive East
Bristol CT 06010

I need a schematic/service manual for a Kris Mach 3-B, amateur bands, 10 and 6 meter, linear amp, serial #112608. I will gladly pay for information!

William G. Sallenger
Rt. 2, Box 524
Windsor NC 27983

I'd like to hear from anyone who has successfully interfaced a Model 33 Teletype machine to a Vic-20. I want to use the Model 33 as a printer for a Vic/AIR-1 system.

Bob Howle WA4ZID
Rt. 1, Box 516
Union MS 39365

I will be on a student bicycle tour in the Cape Cod, Massachusetts, area in the month of August. I plan to operate two meters FM on the trip from the following areas: Truro, Orleans, Nantucket, Martha's Vineyard, and Plymouth and would like to hear from hams in these areas to find out what the best range repeaters are. Any info will be appreciated and acknowledged.

Jeff Gornstein KD2BE
35 Green Hill Road
Springfield NJ 07081

I have been interested in hamming for some time, but until now have never taken the appropriate time to really look into what is necessary to get started. I am a missionary with the Salvation Army, serving in Buenos Aires, Argentina. I have spoken with my father in St. Louis a number of times with the aid of a licensed operator here.

I would like to know how to get started and what equipment is necessary. I will not be able to use a rig here in Argentina, as I only have 1½ years yet here, then will be coming back to the States. And here, to be able to use a ham outfit, you have to have a complete, thorough police clearance (because of the trouble in the past with undercover groups using the radio against the government). But perhaps I can study and get in contact with a licensed operator here who is from the States.

Can you put me in touch with someone who can help me? Any help that you can give or suggest will be greatly appreciated.

Thank you again for your help.

Capitan Richard B. Forney
Ejercito de Salvacion
Sucursal 3, Casilla 194
1403 Buenos Aires
Argentina

Need the schematic and crystal multiplication factor for the KAAR FM TR500 transceiver (450 MHz).

Need schematic and info on adding FM capability to the R-482/URR-35 receiver (225-400 MHz).

Harold D. Donaldson WB6SKV
6650 Phoenix Avenue
Fair Oaks CA 95628

Recently I met a young lady who is traveling to Southern Yemen this summer to be a missionary for two years. I offered to try to set up a schedule with a ham operator in Yemen. Well, I'm sure you already know my problem—the most recent information I have does not list South Yemen as allowing third-party traffic or reciprocal operating licenses. Do you know if the US Embassy there operates a ham or MARS station (I'm in the military), and if so, what would be the best way to set up a schedule so that she could send traffic back home? Do you have any other ideas on how we could work around the third-party traffic regulations? She will be working at a hospital in an American compound only a few hours from the US Embassy.

You can be of tremendous help since I have never before attempted to set up a schedule with a DX station and am running into a lot of problems that I don't know how to work around.

David Patton WA4TQB/0
3410 El Morro Road
Colorado Springs CO 80910

Wanted: Atwater Kent speaker.

G. R. Galbraith K5TVC
4303 Kingaway Drive
Farmington NM 87401

CORRECTIONS

The address for Ham MasterTapes, as it appeared in the May "Review" section, was incorrect. The new address is 136 East 31st Street, New York NY 10016.

Jim Gray W1XU
73 Staff

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

BLACKSBURG VA
MAY 31–JUN 2

Virginia Polytechnic Institute and State University will hold a new workshop, Personal Computer and STD Computer Interfacing for Scientific Instrument Automation, on May 31–June 2, 1984, at Virginia Tech, Blacksburg VA. The workshop is $395.00 for the three days and will be directed by Mr. David E. Larsen, Dr. Paul E. Field, Dr. Jonathan A. Titus, and Dr. Christopher Titus. Each participant will wire and test interfaces. For more information, write Dr. Linda Leffel, CEC, Virginia Tech, Blacksburg VA 24061, or phone (703)-961-4848.

SEASIDE OR
JUN 1–3

The 1984 Oregon State/ARRL Northwestern Division Convention will be held on June 1–3, 1984, at the Seaside Convention Center, Seaside OR. A single convention registration is $5.00 in advance and $7.00 at the door; a couple convention registration is $7.00 in advance and $9.00 at the door; a teen convention registration is $2.00 (children under 12 will be admitted free). Flea-market tables are $5.00 each per day or $8.00 each for two days. Hours on Friday are 5:00 pm to 9:00 pm; on Saturday, 8:00 am to 9:30 pm; and on Sunday, 9:00 am to 2:00 pm. Snack bar food will be available. In addition to the flea market, features will include exhibits, seminars, forums, ladies' and children's activities, an ARRL breakfast, and a Saturday-evening banquet with guest speaker Roy Neal K6DUE, Science Editor of NBC News. Talk-in on 145.45 (−600) and 146.52 simplex. For advance tickets for the banquet ($13.50 each) and registration, send a check payable to Oregon State Ham Convention to Oregon State/ARRL Northwestern Division Convention, PO Box 920, Seaside OR 97138. For additional information, call 1-(503)-640-5456, 1-(503)-738-6461, or 1-(503)-644-0752 evenings.

GUELPH ONT CAN
JUN 2

The Guelph Amateur Radio Club (VE3ZM) will hold the 10th annual Central Ontario Amateur Radio Flea Market and Computerfest on Saturday, June 2, 1984, from 8:00 am to 4:00 pm, at Regal Hall, 340 Woodlawn Road West, Guelph ONT. General admission is $2.00 and children 12 years and under will be admitted free. Vendors' admission is $5.00 per 8-foot space. Doors will be open to vendors only from 6:00 am and a quantity of 3' x 8' tables will be available for rental for $5.00 each. Features will include commercial displays, surplus dealers, computer software and hardware, indoor and outdoor displays, and a refreshment concession. Talk-in on 147.960/147.360 (VE3ZMG) and .52/.52 simplex. For further information, contact Susan Barabus VE3BEC or Joe Barabas VE3BXN at (519)-824-1404 (Guelph), Ralph Bartlett VE3BJX at (519)-836-2097 (Guelph), Henry Christiansen VE3BYU at (519)-743-9022 (Kitchener), Fred Hammond VE3HC at (519)-822-8323 (Guelph), or the Guelph Amateur Radio Club, PO Box 1305, Guelph ONT N1H 6N9, Canada.

ST. PAUL MN
JUN 2

The North Area Repeater Association will sponsor a swapfest and exposition for amateur-radio operators on Saturday, June 2, 1984, in the Dairy Products Building at the Minnesota State Fairgrounds, St. Paul. Admission is $4.00 and children under 12 accompanied by an adult will be admitted free. The hours are 6:00 am to 5:00 pm; activities will begin outside at 6:00 am and inside at 8:00 am. There will be free overnight parking for self-contained campers on June 1st. Features will include exhibits, booths, club activities, demonstrations, and a giant outdoor flea market. Talk-in on .25/.85 and .16/.76. For more information, write Amateur Fair, PO Box 857, Hopkins MN 55343, or call (612)-420 6000.

STEVENS POINT WI
JUN 3

The Central Wisconsin Radio Amateurs, Ltd., will hold its annual swapfest and family picnic on Sunday, June 3, 1984, from 9:00 am to 4:00 pm, at Bukolt Park, Stevens Point WI. Adult admission is $2.00. Selling spaces are $2.50 per table or tailgate, and indoor selling areas will be available. There will be food, refreshments, and picnic tables. Talk-in on 146.07/.67 and .22/.82. For further information, contact Frank Guth W9BCC, 1632 Ellis Street, Stevens Point WI 54481, or phone (414)-344-2566, or contact Jim Benak KA9ACE, 1775 Strongs Avenue, Stevens Point WI 54481, or phone (414)-344-5943.

MANASSAS VA
JUN 3

The Ole Virginia Hams ARC, Inc., will hold the tenth annual Manassas Hamfest on Sunday, June 3, 1984, beginning at 8:00 am, at Prince William County Fairgrounds, VA Route 234, ½ mile south of Manassas VA. Admission is $4.00 per person (children under 12 will be admitted free) and there will be no advance sales. Activities will include 25 acres of tailgating (setups at 7:00 am), indoor commercial exhibits, breakfast and lunch menus, a YL program, and CW proficiency awards. Talk-in on 146.37/.97 WA4FPM (Manassas repeater) and 146.52 simplex. For more information, write Hamfest, c/o Ole Virginia Hams ARC, Inc., Manassas VA 22110, or phone (703) 361-8468.

CHELSEA MI
JUN 3

The Chelsea Swap and Shop will be held on Sunday, June 3, 1984, from 8:00 am to 2:00 pm, at the Chelsea Fairgrounds, Chelsea MI. The donation is $2.50 in advance and $3.00 at the gate. Children under 12 and non-ham spouses will be admitted free. Table space is $7.00 per 8 feet (ladies' tables welcome) and trunk sales are $2.00 per space; gates will open for sellers at 5:00 am. There will be plenty of parking, including special parking for the handicapped. Talk-in on 146.52 simplex and the 147.855 Chelsea repeater. For more information, write William Altenberndt WB8HSN, 3132 Timberline, Jackson MI 49201, or phone (517)-764-5785.

PITTSBURGH PA
JUN 3

The 30th annual Breeze Shooters Hamfest will be held on Sunday, June 3, 1984, from 9:00 am to 4:00 pm, at the White Swan Amusement Park, PA Rte. 60 (Parkway West), near the Greater Pittsburgh International Airport. Registration is $2.00 or 3 for $5.00. Sheltered tables for vendors are available by advance registration only. Admission and flea-market spaces are free. There will be food available and activities will include the family amusement park. Talk-in on .28/.88 and 29 MHz. For further information, please write Don Myslewski K3CHD, 359 McMahon Road, North Huntingdon PA 15642, or phone (412)-863-0570.

ROME NY
JUN 3

The Rome Radio Club, Inc., will present the 32nd edition of its Rome Ham Family Day on Sunday, June 3, 1984, at Beck's Grove, Rome NY. Activities will include games, contests, educational and scientific displays and presentations, and a large flea market. Good food and beverages will be available throughout the day, which will be climaxed by a dinner and the Ham-of-the Year award.

KINGSTON PA
JUN 3

The Murgas ARC (K3YTL) will sponsor the annual Wilkes-Barre Hamfest on Sunday, June 3, 1984, beginning at 8:00 am, rain or shine, at the 109th Armory, Market Street, Kingston (across the river from Wilkes-Barre). Admission is $3.00; children under 16 and XYLs will be admitted free. There will be indoor and outdoor tailgating at $2.00 per space. Setups only will be at 6:00 am and tables and commercial power will be available. Talk-in on 146.01/.61 and .52 simplex. For further information, write Hamfest Committee, PO Box 1094, Wilkes-Barre PA 18703.

SOUTHINGTON CT
JUN 3

The Southington Amateur Radio Association will hold a flea market on Sunday, June 3, 1984, at the Central Elementary School, Main Street (Route 10), just outside Southington Center. Take exit 32 from I-84 to Route 10 south for 1.4 miles. The school is on the right, across from the Public Library. Admission is $1.00. Tables are $7.00 each in advance and $8.00 each at the door (no tailgating); two people will be admitted with each table purchased. There will be over 30 tables of new and used ham equipment, and hot coffee and refreshments will be available. Talk-in on 146.28/.88 and 145.550 simplex. For a table reservation, send an SASE and check (payable) to SARA, PO Box 284, Southington CT 06489.

PRINCETON IL
JUN 3

The Starved Rock Radio Club (W9MKS) will present its annual hamfest on June 3, 1984, at the Bureau County Fairgrounds in Princeton IL. Registration is $2.50 in advance (before May 20) and $3.00 at the gate. There will be a nominal fee for recreational vehicles. Features will include a free swap area, commercial vendor exhibits, an ARRL seminar, and plenty of parking. Good food will be available. Registrants will receive free coffee and doughnuts at 8:00 am. Talk-in on 147.12/.72, 146.07/.67, and 146.52 simplex. For advance registration or more information, send a large SASE to SRRC/W9MKS, RFD #1, Box 171, Ogleaby IL 61348, or phone (815) 667-4614.

TERRE HAUTE IN
JUN 3

The 38th annual Wabash Valley Amateur Radio Hamfest will be held on June 3, 1984, at the Vigo County Fairgrounds on US-41, ½ mile south of I-70. Registration is $2.00 each or 3 for $5.00 in advance and $3.00 each at the gate (children under 12 will be admitted free). A covered 12' x 12' flea-market space is $3.00; outdoor flea-market space is free. Some ac and tables will be available on a first-come basis. There will be computer and packet-radio forums, food and refreshments, and overnight camping. A giant shopping mall is located nearby. For tickets and detailed information, send an SASE to WVARA Hamfest, PO Box 81, Terre Haute IN 47808.

DALTON MA
JUN 3

The Northern Berkshire Amateur Radio Club will hold a flea market on Sunday, June 3, 1984, at the Dalton American Legion, Route 9, Dalton MA (near Pittsfield). Admission is $1.00 and a few tables will be available at no charge on a first-come, first-serve basis. A breakfast and lunch bar will be provided by the Dalton American Legion, and free overnight camping will be permitted on a first-come, first-serve basis. Talk-in on 146.91 (Mt. Greylock).

HUMBOLDT TN
JUN 3

The Humboldt Amateur Radio Club will hold its annual hamfest on Sunday, June 3, 1984, at Bailey Park, Humboldt TN. Admission is $2.00. There will be a flea market, ladies' activities, lunches, refreshments, and RV parking. Talk-in on 146.37/.97. For more information, contact Ed Holmes W4IGW, 501 N. 18th Avenue, Humboldt TN 38343.

BOWLING GREEN KY
JUN 9

The Kentucky Colonel Amateur Radio Club will hold its 2nd annual hamfest on June 9, 1984, from 8:00 am to 3:00 pm, at the JC Pavilion at the Southern Kentucky Fairgrounds, Bowling Green KY. Tickets are $2.00 in advance and $3.00 at the door. Features will include an inside and outside flea market, inside displays of new equipment, food, free coffee, and free parking. Talk-in on 146.25/.85 and 146.52 simplex. For further information, write Ed Gann N4HID, Box 92, Route 19, Bowling Green KY 42101, or call (502)-843 6911.

COEUR D'ALENE ID
JUN 9

The Kootenai Amateur Radio Society will sponsor Hamfest '84 on June 9, 1984, from 8:00 am to 4:00 pm, at the North Idaho Fairgrounds, Coeur D'Alene ID. Swap tables will be available at no charge; RVs are welcome but no hookups will be available on site. The annual Friday program will include a pot luck supper and dancing afterwards. For further information, write Avon Anderson WB7WBZ, N. 1035 Highland Court, Post Falls ID 83854.

WILLOW SPRINGS IL
JUN 10

The Six Meter Club of Chicago, Inc., will

hold its 27th annual hamfest on Sunday, June 10, 1984, at Santa Fa Park, 91st and Wolf Road, Willow Springs IL (southwest of downtown Chicago). Registration is $2.00 in advance and $3.00 at the gate. Gates will open at 6:00 am and features will include a large swappers' row, displays in the pavilion, an AFMARS meeting, picnic grounds, refreshments, and plenty ot parking space. Talk-in on 146.52 (K9ONA) and .37/.97 (K9ONA/R). For advance tickets, contact Val Hellwig K9ZWV, 3420 South 60th Court, Cicero IL 60650

NEWINGTON CT
JUN 10

The 1984 Newington Amateur Radio League Flea Market will be held on Sunday, June 10, 1984, from 9:00 am to 4:00 pm, at Newington High School, 605 Willard Avenue (Rte. 173). Admission is $2.00 at the door, tailgating (weather permitting) is $5.00, and tables are $10.00. Dealers may set up at 8:00 am. A portion of the proceeds will be used for the NARL Scholarship Fund Features will include abundant amateur radio and computer gear, free tours of W1AW and the ARRL Museum (from 10:00 am to 2:00 pm), and TVRO, packet-radio, and ATV demonstrations. Talk-in on 146.52, 144.85/145.45, or 223.24/224.84 MHz. For more information, contact Tom Namnoum KM1O, 55 Spruce Street, Newington CT 06111, or phone (203)-666-1615.

LEWISBURG PA
JUN 10

The Milton Amateur Radio Club will hold their 13th annual hamfest on Sunday, June 10, 1984, from 6:00 am to 5:00 pm, rain or shine, at the Winfield Fire Company grounds on Route 15, south of Lewisburg PA and 8 miles south of exit 30 on I-80. Covered spaces are available. Registration is $3.00 and wives and children will be admitted free. There will be a flea market, an auction, and contests. Talk-in on 146.37/.97 and 145.025/.625. For further details, write Jerry Williamson WA3SXQ, 10 Old Farm Lane, Milton PA 17847, or phone (717)-742-3027.

BELLEFONTAINE OH
JUN 10

Hamboree '84 will be held on Sunday, June 10, 1984, beginning at 8:00 am, at the Logan County Fairgrounds, E. Lake Street, Bellefontaine OH. Ticket donations are $2.00 in advance and $2.50 at the door; tables are $3.00 (no trunk sales). There will be food and plenty of free parking at the fairgrounds. Talk-in on 147.60/.00 and 146.52. For ticket information, write Steve Kidder N8ETD, Box 265, Russells Point OH 43348, or call 1-(513)-843-6099.

DEAL NJ
JUN 10

The Jersey Shore Chaverim will sponsor the third annual Ham & Computer Feat on June 10, 1984, from 9:00 am to 4:00 pm, at the Jewish Community Center, 100 Grant Avenue, Deal NJ (less than 50 miles from NYC and 70 miles from Philadelphia). Admission is $3.00 per person and children under twelve and XYLs will be admitted free. Indoor tables are $8.00 and tailgating spaces are $3.50 each. For reserved spaces, send an SASE and payment by June 1st to Jersey Shore Hamfest, PO Sox 192, West Long Branch NJ 07764. Talk-in on 147.045 + .6, 145.110 − .6, and 146.52 simplex. For more information, call Arnold W2GDS at (201)-222-3009.

DAYTON OH
JUN 15-17

The ninth annual MACC Computerfest will be held on June 15-17, 1984, at the Dayton Convention Center. Tickets are $5.00 until May 31st and $6.00 thereafter. Features will include commercial exhibits, a computer and electronics flea market, seminars and mini-courses, a computer film program, a hospitality suite, and contests. For more information, write Computerfest '84, PO Box 24505, Dayton OH 45424.

CORTLAND NY
JUN 16

The 2nd annual SARC Hamfest and Flea Market will be held on Saturday, June 16, 1984, from 8:00 am to 5:00 pm, rain or shine, at the Cortland County Fairgrounds, Cortland NY (Exit 12 off I-81, midway between Syracuse and Binghamton). The donation is $2.00 and jr. ops under 12 and XYLs will be admitted free. Indoor tables and spaces are $3.00 each and undercover (pole-barn) spaces are $2.00 each. There will be indoor and outdoor flea markets, acres of free parking, and refreshments. Talk-in on .52 simplex. For table and space reservations, send a check to Elmer Fuller, Treasurer, 129 Chelsea Twins, Cortland NY 13045. For more details, contact Bud Jackson K2ZER, Skyline Amateur Radio Club, 8 Sunnyfield Drive, Cortland NY 13045.

DUNELLEN NJ
JUN 16

The Raritan Valley Radio Club will hold its 13th annual hamfest on Saturday, June 16, 1984, beginning at 8:30 am, at Columbia Park, Dunellen NJ. Donations for lookers are $2.00 each; sellers' spots are $5.00 each (tables are not supplied). Food and drink will be available at the refreshment stand. Talk-in on 146.025/.625 (W2OW/R) and 146.52 simplex. Advance tickets may be purchased trom any club member. For further information, call Jack Fisher W2IWK at (201)-756-2546, or Ted Kopf WB2TKU at (201)-725-3481 between 10:00 am and 10:00 pm.

CROWN POINT IN
JUN 17

The Lake County (Indiana) Amateur Radio Club will hold its 12th annual Dad's Day Hamfest on June 17, 1984, 8:00 am to 2:00 pm, at the Industrial Arts Building at the Lake County Fairgrounds, Crown Point IN. Tickets are $2.50. All events will be held indoors and there will be plenty of parking and food. Talk-in on 147.84/.24 and .52. For further information, contact Bill De Geer W9TY, Hamfest Chairman, 3601 Tyler Street, Gary IN 46408.

FREDERICK MD
JUN 17

The Frederick Amateur Radio Club will hold its 7th annual hamfest on June 17, 1984, from 8:00 am to 4:00 pm, at the Frederick Fairgrounds. Admission is $3.00 and YLs and children will be admitted free. Tailgaters will be charged an additional $2.00; exhibitors' tables are $10.00 for the first and $5.00 for each additional one. Gates will open for exhibitors at 8:00 pm on June 16, 1984, and overnight security will be provided. Overnight parking will be welcomed. For further information, write Jim Devilbiss WA3FUJ, 915 Pine Avenue, Frederick MD 21701, or phone (301)-662-5784.

SANTA MARIA CA
JUN 17

The Satellite Amateur Radio Club will hold its 1984 Santa Maria Swapfest and Santa Maria Style Barbecue on Father's Day, June 17, 1984, beginning at 9:00 am, at the Union Oil Company Newlove Picnic Grounds, south of Santa Maria CA, off US 101. The barbecue will be served at 1:00 pm and tickets are $7.95 for adults and $3.50 for children. In addition to the barbecue, there will be swap tables, contests, and games. Talk-in on 146.34/.94 (WB6IIY/R) and 7230 kHz LSB. For further information, tickets, or swap-table reservations ($3.50 per space), please write Satellite Amateur Radio Club Swapfest, PO Box 5117, Vandenberg Air Force Base CA 93437, and make checks payable to Santa Maria Swapfest.

LAS VEGAS NV
JUN 21-24

The YL International Single Sideband System's annual convention will be held on June 21-24, 1984, at the Sahara Hotel, Las Vegas NV. Deluxe accommodations and RV parking are available for reasonable rates. Planned activities include a tour of Hoover Dam, a Lake Mead cruise, a gala stage show, a cocktail party, a banquet, and a breakfast buffet, as well as the DX forum and business meetings. YLRL ladies are invited to meet Thursday evening, June 21, at 8:00 pm. A convention station will be operating on 14,332 kHz. For complete details and a registration packet, send a business-size SASE (37¢ postage) to Jan Weaver N7YL, 2195 East Camero Avenue, Las Vegas NV 89123.

ELGIN IL
JUN 21-23

The Antique Radio Club of America and the Antique Radio Club of Illinois will hold Radiofest '84 on June 21-23, 1984, at the Holiday Inn, I-90 and Illinois 31, Elgin IL. Antique and classic amateur equipment of all kinds, as well as other vintage radio memorabilia, will be on display and for sale. Amateur-radio participation is welcomed Talk-in on 146.52. For more details, write Joe Willis, Box 14732, Chicago IL 60614.

LIVONIA MI
JUN 29-30

The Livonia Amateur Radio Club will host the 1984 ARRL Michigan State Convention on June 29-30, 1984, on the campus of Schoolcraft College, 18600 Haggerty Road at Seven Mile Road, Livonia MI (22 miles northwest of downtown Detroit). Schoolcraft is easily accessible via Interstates 75, 275, 96, or 94. The Swap-N-Shop will be in the main gymnasium, and one of the two parking lots will be set aside for trunk sales. Major exhibitors will be in the swap area, if requested. Exhibitors' setups will be on Friday, June 29th, from 12:00 noon until 10:00 pm, and the displays will be open on Saturday, June 30th, from 8:00 am until 5:00 pm. There will be security provided on Friday night. For more information, write Wayne W. Wiltse K8BTH, General Chairman, 1984 ARRL Michigan Convention Committee, 14468 Bassett Avenue, Livonia MI 48154.

SWIFT CURRENT SASK
JUN 30

The Saskatchewan Hamfest will be held on June 30, 1984, in Swift Current SASK. Registration will be the evening before. Features will include contests, displays, a ladies' program, and a banquet. For more details, contact the Saskatchewan Hamfest Committee, Box 6, Swift Current SASK S9H 3V5, Canada.

GRAND RAPIDS MI
JUN 30

The Independent Repeater Association of Grand Rapids MI will hold its annual Hamfestival on Saturday, June 30, 1984, from 8:00 am until 4:00 pm, at the Wyoming National Guard Armory, 44th Street, just west of the US-131 expressway. Admission is $3.50. Free table space will be provided to all sellers and dealer setups will be at 6:00 am. Programs will include satellite operations, packet radio, a W5LFL space shuttle movie, an AMTOR forum, a CW rx contest, an antenna forum, and a shack picture contest. Talk-in on 147.165/147.765. For advance table reservations or for more information, call Linda Hurley WD8OHW at (616)-457-1253, or write IRA, 562 92nd Street SE, Byron Center MI 49315.

MAPLE RIDGE BC CAN
JUN 30-JUL 1

The Maple Ridge ARC will host Hamfest 84 on June 30-July 1, 1984, at the Maple Ridge Fairgrounds, 30 miles east of Vancouver. The registration fee is $5.00 for hams and $2.00 for non-hams over 12 years old Features will include a swap and shop, commercial displays, bunny hunts, and ladies' and children's programs. Food and camper space with electricity will be available. Talk-in on 146.20/.80 and 146.34/.94. For more information or pre-registration (20% off gate fee), contact Maple Ridge ARC, Box 292, Maple Ridge BC V2X 7G2.

OVERLAND PARK KS
JUL 4-7

The Mobile Amateur Radio Awards Club, Inc., will hold their annual convention from Wednesday to Saturday, July 4-7, 1984, at the Holiday Inn in Overland Park KS. There will be a picnic for early arrivals on Wednesday evening, and on Thursday there will be area tours and a dinner theater. On Friday there will be antenna and computer forums, and on Saturday morning the annual business meeting will be held The hospitality suite will be open during the entire convention. For more information, send an SASE to R L Dyson K0AYO, R1, Box 230 M, De Soto KS 66018.

MAHOPAC NY
JUL 7

The Putnam Emergency Amateur Repeater League (PEARL) will hold its 3rd annual hamfest on Saturday, July 7, 1984, from 9:00 am to 4:00 pm, at St. John's School Monsignor O'Brien Boulevard, Mahopac NY. General admission is $1.00, indoor tables are $5.00 each, and outdoor tailgating is $4.00. Talk-in on 144.535/145.135 and 146.52. For advance registration and more information, contact Frank Konecnik WB2PTP, RD1, 244 C, Carmel NY 10512.

FARIBAULT MN
JUL 7

The Faribault Amateur Radio Club will hold its 3rd annual swapfest on Saturday, July 7, 1984, from 9:00 am to 3:00 pm, at Rice County Fairgrounds, Faribault MN. Tables are available only by reservation before July 1st. Talk-in on 146.19/.79. For more information, contact Mike Ferguson N6DGG at (507)-744-5145 after 5:00 pm.

OAK CREEK WI
JUL 7

The South Milwaukee Amateur Radio Club will hold its annual swapfest on Saturday, July 7, 1984, from 7:00 am to approximately 5:00 pm, at the American Legion Post #434, 9327 South Shepard Avenue, Oak Creek WI 53154. Admission is $3.00 per person and includes a "Happy Hour" with free beverages. Parking, a picnic area, hot and cold sandwiches, and liquid refreshments will be available. There will be free overnight camping. Talk-in on 146.94 MHz FM. For more details, including a local map, write South Milwaukee Amateur Ra-

indoor and outdoor programs, and special events for ladies and children. For further information, contact Joxa Hartikainen OH7OO, Kauppakatu 45, SF 70100 Kuopio, Finland.

GLACIER PARK MT
JUL 20-22

The Great Falls Area ARC will present the 50th annual Glacier-Waterton International Hamfest on July 20-22, 1884, at Three Forks Campground on the southern edge of Glacier National Park. Pre-registration is $8.50 and includes Saturday-night dinner (bring own meat and utensils) and Sunday-morning breakfast. Talk-in on .52 and .34/.94. For more information, send an SASE to Shirley Smith KC7OA, 1822 14th Avenue South, Great Falls MT 59405.

PETOSKEY MI
JUL 21

The Straits Area ARC will hold its annual swap shop and computer demonstration on July 21, 1984, from 9:00 am to 2:00 pm, in the 4-H Building at the Emmet County Fairgrounds. Admission is $2.50 and tables are $3.00 each; setups are at 8:00 am. RV camping will be available nearby. Talk-in on 146.67 and .52. For more details, write Irene Stein KA8NKS, 4487 Robinson Road, Pellston MI 49769, or phone (616) 539-8986.

EUGENE OR
JUL 21-22

The 9th annual Lane County Ham Fair will be held on July 21-22, 1984, at the Oregon National Guard Amory, 2515 Centennial (across from Autzen Stadium), Eugene OR. Doors will open at 8:00 am both days. Registration and swap tables are $5.00 each. Because ot limited space, a nonrefundable reservation is required for swap tables (maximum: 2). In addition to swap tables, features will include a 2-meter bunny hunt, technical seminars, computer demonstrations, license exams, bingo, a kiddie korner, and women's activities. There will be an all-day snack bar, free parking for RVs (no hookups), and a Saturday pot-luck supper at 6:00 pm. Talk-in on 146.28/.88, 147.86/.26, and on .52/.52. For advance tickets or table reservations, send a check payable to Lane County Ham Fair and an SASE to Tom Temby WB7WPU, Treasurer, 3227 Crocker Road, Eugene OR 97404, or phone (503)-689-1761. Ticket packets may also be picked up at the pre-registration table at the Ham Fair.

WHEELING WV
JUL 22

The Triple States Radio Amateur Club will hold its 6th annual Wheeling WV Hamfest on Sunday, July 22, 1964, from 9:00 am to 4:00 pm, at Wheeling Park. Admission is $3.00 and children 12 and under will be admitted free. Dealers are welcome and tables are available. There will be a flea market and auctions, all under cover. Refreshments and free parking will be available. Talk-in on 146.31/.91 and 147.75/.15. For a four-page brochure with more information and a map, contact TSRAC, Box 240, RD 1, Adena OH 43901, or phone (614)-546-3930.

BEAVERTON OR
JUL 27-29

The Willamette Valley DX Club will hold the 1984 DX Convention on July 27-29, 1984, at the Greenwood Inn, Beaverton OR. For further information, write Bob Herndon W7XN, 607 Andover Place, Portland OR 97202, or phone (503)-232-2740.

HOUGHTON MI
JUL 28

The Copper Country Radio Amateur Association will host the 1984 Upper Peninsula Hamfest on July 28, 1984, at the Memorial Union Cafeteria on the campus of Michigan Technological University, Houghton MI. For further information, write Howard Junkin N8FHF, Co-Chairman, UP Hamfest, 106 West South Street, Houghton MI 49931, or phone (906)-482-4630.

WEST FRIENDSHIP MD
JUL 29

The Baltimore Radio Amateur Television Society (BRATS) will present the BRATS Maryland Hamfest and Computerfest on Sunday July 29, 1984, at the Howard County Fairgrounds, Route 144 at Route 32, adjacent to Interstate 70, West Friendship MD, about 15 miles west of the Baltimore Beltway (695). Table sales are by advance reservation only; indoor tables along the wall with ac are $20.00 each and indoor tables in the center of the floor without ac are $10.00 each. Quantity discounts and booths are available. There will be plenty of outdoor tailgating and RV hookups will be available. Dealer setups begin Saturday at 2:00 pm with overnight security provided. Talk-in on 146.76 (−600), 147.03 (+600), and .52 simplex. For table reservations and more information, write BRATS, PO Box 5915, Baltimore MD 21208, or call Mayer Zimmerman W3GXK at (301)-655-7812.

NASHVILLE TN
JUL 29

The Radio Amateur Transmitting Society will hold the sixth annual Nashville Ham and Computer Fest on Sunday, July 29, 1984, from 8:00 am to 3:30 pm, at the Nashville Municipal Auditorium at the intersection of James Robertson Parkway and Gay Street in downtown Nashville TN. There will be no admission charge and tables will be available for $5.00. For further information, send an SASE to Willie Porter KB4BLL, 4907 Idaho Avenue, Nashville TN 37209.

TRAIL BC CAN
AUG 4

The Beaver Valley Amateur Radio Club will hold a swapfest on August 4, 1984, beginning at 10:00 am, at the Cominco Arena, Trail BC. Talk-in on 146.84/.24. For further information and reservations for table space, please contact BVARC, c/o 3798 Woodland Drive, Trail BC V1R 2V7.

LAFAYETTE IN
AUG 19

The Tippecanoe Amateur Radio Association will hold its 13th annual hamfest on Sunday, August 19, 1984, beginning at 7:00 am, at the Tippecanoe County Fairgrounds, Teal Road and 18th Street, Lafayette IN. Tickets are $3.00. Features will include a large flea market, dealers, and refreshments. Talk-in on .13/.73 and .52. For advance tickets and more information, write Lafayette Hamfest, Route 1, Box 63, West Point IN 47992.

TRUMANSBURG NY
AUG 25

The Finger Lakes Hamfest will be held on August 25, 1984, at the Trumansburg Fairgrounds, 12 miles NW of Ithaca NY. There will be exhibits, a flea market, refreshments, and overnight camping. For

dio Club, PO Box 102, South Milwaukee WI 53172.

ALEXANDER NY
JUL 8

The Genesee Radio Amateurs, Inc., will hold the Batavia Hamfest on Sunday, July 8, 1984, from 7:00 am to 5:00 pm, at the Alexander Firemen's Grounds, Rte. 96, Alexander NY. Admission is $3.00 in advance before June 22, 1984, and $4.00 at the door. The commercial exhibit area will open at 9:00 am and there will be hot-air-balloon rides. Activities will include breakfast at 6:00 am, a CW contest, OM and YL programs, a .52 check-in contest, a flea market, a chicken barbecue, and free camping (electricity is $2.00). Talk-in on 6.52 and 4.71/5.31 (W2RCX). For further information, contact GRAM, PO Box 572, Batavia NY 14020.

BOWLING GREEN OH
JUL 8

The 20th annual Wood County Ham-A-Rama will be held on Sunday, July 8, 1984, beginning at 8:00 am, at the Wood County Fairgrounds, Bowling Green OH. Admission and parking are free. Trunk sales and food will be available. Advance table rentals are $5.00 and are for dealers only. Saturday will be available for setups until 8:00 pm. Talk-in on .52. For more information or dealer rentals, send an SASE to Wood County ARC, c/o Craig Henderson, Box 366, Luckey OH 43443.

SHEBOYGAN WI
JUL 14

The fifth annual Sheboygan County Amateur Radio Club Lakeshore Swapfest and Brat Fry will be held on July 14, 1984, from 10:00 am to 4:00 pm, at the Wilson Town Hall, south of Sheboygan WI. Tables are free and camping is available at Terry Andre State Park. For a flyer and other information, write Julian E. Jetzer KR9S, 8400 Hawthorn Road, Sheboygan WI 53081, or phone (414)-457-3368 after 5:00 pm CDT.

MILTON ONT CAN
JUL 14

The Burlington Amateur Radio Club will host the tenth annual Ontario Hamfest on July 14, 1984, from 7:00 am to 4:00 pm, at the fairgrounds in Milton ONT. Tickets are $2.50 in advance and $4.00 at the gate. Weekend camping, free parking, and free flea-market tables will be available. Features will include indoor commercial displays as well as the traditional events. Talk-in on .21/.81 (club repeater). For more details, contact BARC, PO Box 838, Burlington ONT L7R 3Y7, Canada.

EAU CLAIRE WI
JUL 14

The Eau Claire Amateur Radio Club will hold its annual hamfest on Saturday, July 14, 1984, from 8:00 am to 4:00 pm, at the 4-H buildings in Eau Claire WI. Tickets are $2.00 in advance and $3.00 at the door; tables and coffee are free. Talk-in on .31/.91 and .52 simplex. For more information and tickets, send an SASE to Gene Lieberg KA9DWH, 2840 Saturn Avenue, Eau Claire WI 54703.

AUGUSTA NJ
JUL 14

The Sussex County ARC will sponsor SCARC '84 on Saturday, July 14, 1984, beginning at 8:00 am, at the Sussex County Fairgrounds, Plains Road, off Rte. 206, Augusta NJ. Admission is $2.00. Indoor tables are $5.00 in advance and $6.00 at the door; tailgate space is $4.00 in advance and $5.00 at the gate. There will be food and refreshments and plenty of free parking. Talk-in on .90/.30 and .52 simplex. For further information, write Donald R. Stickle K2OX, Weldon Road, RD #4, Lake Hopatcong NJ 07849, or phone (201)-663-0677.

CHARLESTON SC
JUL 14-15

The Charleston Amateur Radio Society will hold its annual hamfest on July 14-15, 1984, at the Omar Shrine Temple. Talk-in on 146.19/.79. For further information, write Hamfest Committee, PO Box 70341, Charleston Heights SC 29405.

BOISSEVAIN MAN CAN
JUL 14-15

The 21st annual International Hamfest will be held on July 14-15, 1984, at the International Peace Garden between Dunseith ND and Boissevain MAN. Activities will include transmitter hunts, mobile judging, and a CW contest. Excellent camping facilities will be available. For more information, contact William W. Bosch WD0EMY or Stanley E. Kittelson WD0DAJ, Box H, Dickinson ND 58601.

LOUISVILLE OH
JUL 15

The Tusco Amateur Radio Club (W8ZX) and the Canton Amateur Radio Club (W8AL) will present the 10th annual Hall of Fame Hamfest on Sunday, July 15, 1984, at the Nimishillen Grange, 6461 Easton Street, Louisville OH. Admission is $2.50 in advance and $3.00 at the gate. Tables are for rent on a reserved basis. Talk-in on 146.52/.52 and 147.71/.12. For reservations or more information, write Butch Lebold WA8SHP, 10877 Hazelview Avenue, Alliance OH 44601, or phone (216)-821-8794.

LAPORTE IN
JUL 15

The combined LaPorte-Michigan City Amateur Radio Clubs will sponsor their Summer Hamfest on Sunday, July 15, 1984, from 8:00 am to 2:00 pm, at the LaPorte County Fairgrounds, State Road 2, west of LaPorte IN. The donation is $3.00 at the gate. Good food, cold drinks, and paved outdoor parking will be available. For reservations for indoor tables (40¢/foot), write PO Box 30, LaPorte IN 46350.

KUOPIO, FINLAND
JUL 19-22

The Amateur Radio Club of Kuopio will hold the annual hamfest of the Finnish Amateur Radio League (SRAL) on July 19-22, 1984, in Rauhalahti. Activities will include SRAL forums, technical and DX talks,

more information, contact Wanda Lovejoy KO2X, 443 Jerry Smith Road, Lansing NY 14882.

MARYSVILLE OH
AUG 26

The Union County Amateur Radio Club will hold its 8th annual hamfest on Sunday, August 26, 1984, beginning at 6:00 am, at the fairgrounds in Marysville OH. Tickets are $2.50 in advance and $3.00 at the gate; XYLs and children will be admitted free. A 10-foot flea-market space is $1.00 (no electricity available). There will be food. For further information and tickets, contact Gene Kirby W8BJN, 13613 US 36, Marysville OH 43040, or phone (513)-644-0468.

CHEROKEE OK
AUG 26

The 2nd annual Great Salt Plains Hamfest will be held on August 26, 1984, from 9:00 am to 5:00 pm, at the Community Building on the south side of the Great Salt Plains Lake in north-central Oklahoma. Features will include technical forums, organizational meetings, free swap tables, refreshments, Novice exams, and a noon pot-luck dinner. Overnight camping and RV hookups are available at the Lakes State Park. Talk-in on the 147.90/.30 Salt Plains repeater. For more information, write Steven Walz WA5UTO, Box 222, Cherokee OK 73728, or phone (405)-596-3487.

WINDSOR ME
SEP 8

The Augusta Emergency Amateur Radio Unit will sponsor the 1984 ARRL-sanctioned Windsor Hamfest on Saturday, September 8, 1984, at the Windsor Fairgrounds, Windsor ME. The gate donation is still $1.00 and camping will be available on Friday and Saturday nights. Features will include a flea market, programs, speakers, commercial distributors, light meals, and the traditional Saturday bean and casserole supper. Talk-in on the 146.22/.82 repeater. For further information, contact Don Hanson N1AZH, RFD #2, Box 3678, Greene ME 04236, or phone (207)-946-7557.

SAN ANGELO TX
SEP 8-9

The San Angelo Amateur Radio Club will hold CEN TEX HAMFEST '84 on September 8-9, 1984, in the San Angelo Convention Center. Tickets are $5.00 in advance and $6.00 at the door. Hours for Saturday are noon to 6:00 pm and for Sunday, 8:00 am to 2:00 pm. Special events for the ladies include a Saturday afternoon tour of Fort Concho and Old San Angelo. There will be seminars and group meetings Saturday afternoon and Sunday morning, and a reception for dealers, followed by a social hour for amateurs, on Saturday night. Talk-in on 148.34/.94. For pre-registration or hotel/motel accommodations, write CEN TEX HAMFEST '84, PO Box 3751, San Angelo TX 76902.

AUGUSTA GA
SEP 16

The Amateur Radio Club of Augusta will hold its annual hamfest on September 16, 1984, at Julian Smith Casino Park. Tickets are $1.00 each, 6 for $5.00, or 13 for $10.00. Features will include a flea market in the parking lot, a barbecue, refreshments, dealers, entertainment, and on Saturday evening, a hospitality room at Ramada Inn West, Washington Road, rooms 108-110. Talk-in on 145.49 – 600. For more information, send an SASE to D. F. Miller WB4YHT, Hamfest Chairman, 4505 Shawnee Road, Martinez GA 30907, or call 1-(404)-860-3700.

NEW KENSINGTON PA
SEP 16

The Skyview Radio Society will hold its annual hamfest on Sunday, September 16, 1984, from noon until 4:00 pm, at the club grounds on Turkey Ridge Road, New Kensington PA. Registration fee is $2.00 and vendors' fees are $4.00. Awards will be presented. Talk-in on .04/.64 and .52 simplex.

WICHITA KS
SEP 23

The Wichita Hamfest will be held on September 23, 1984, at Camp Hiawatha, 1701 West 51st Street North, Wichita KS 67204. Features will include a flea market, programs, and commercial exhibits. For more information, contact Norm Tramba WA0HWH, 340 S. 1st, Clearwater KS 67026, or phone (316)-584-6425.

PARAMUS NJ
OCT 14

The Bergen ARA will hold a Ham Swap 'n' Sell on October 14, 1984, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. There will be tailgating only; bring your own table. Admission for sellers is $4.00; buyers will be admitted free. Thousands of spaces will be available. Talk-in on .79/.19 and .52. For more information, write Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855, evenings only.

HAM HELP

I am looking for the service manual for the Tennelec Memoryscan MS-2. I will pay for postage and copying cost.

Robert Madoux KB9JE
1577 Poag Road
Edwardsville IL 62025

I would like to obtain/purchase information and/or books/publications on construction of linear amplifiers for amateur-radio applications and the correct use of such equipment.

I would also like to learn more about the Yaesu FT-980 CAT system.

Eugene P. Monahan
167 Princeton Road
Piscataway NJ 08854

Hallicrafters HT32 transmitter schematic and tuning instructions wanted. Will pay for reproduction costs.

Harold D. Donaldson WB8SKV
8850 Phoenix Avenue
Fair Oaks CA 95628

✓See List of Advertisers on page 114

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 6

seem to quickly get lost when emotional factors come up. Let's take a look at what experience has taught us so we won't forget it.

1. In virtually every emergency, the first thing that goes out is the telephone. Storms, rain, fire, explosions, downed planes—either the wires go down or the switching systems bog down and radio is all that's left. This means that in emergencies radio is suddenly going to have to be able to handle an enormous amount of message traffic.

2. With few exceptions, the other radio services are inexperienced in dealing with emergencies, are unequipped to provide the equipment and technical people, can't interconnect with other services, and are unable to provide short-, medium-, and long-range communications. The only service really geared to providing serious emergency communications is amateur radio, and amateurs should plan to be able to intercommunicate with other services so as to help the police and fire departments, for instance, keep in touch.

3. In every emergency situation, the amount of message traffic is vastly beyond the capability of the few available trained operators to handle. This could be solved by developing equipment which does not require trained operators to use and by making the communications as high-speed as is practical.

4. Equipment and skills which are not in everyday use are just not dependable in time of emergency.

A nuclear attack (which is the most serious emergency now conceivable) is what is called the "worst case." Other than hoping that some ham will crawl out of his cellar with an intact HT or mobile HF rig and start from scratch, is there anything we can do? That scenario isn't likely to dissuade Russia from taking advantage of a perceived communications weakness some day.

Would that I could be as blasé about American security as most hams (in other words, just not even think about it) and get annoyed if the subject is brought up.

After working with a group of dedicated hams for several years on this matter of ham emergency communications, certain limiting factors have become evident. One is the relatively small number of active hams we have, particularly younger ones who will have the stamina it will take to survive an attack and set up communications. The other is the dependency on communications which are both inherently slow and depend heavily on difficult-to-learn operator skills.

Amateur radio is so pathetically far behind in technology that there is no real justification for the continuance of the hobby from that viewpoint. Indeed, our leaders have allowed the pressures from old-timers to so influence the hobby that there is little honest justification for the hobby on any basis. One of these days someone is going to say out loud that the emperor has no clothes and we could lose all those nice private frequencies. No more DX pileups. No more traffic nets sending useless messages just to do something. No more rag-chewing. No more repeater clunking. No more repeater wars. No more jamming of nets. No more bands jammed with contesters. No more certificate-hunting. No more ham club meetings with three-hour arguments on what color to paint the clubhouse. What would we do? What would we do?

A generation or two ago there were some strong justifications for amateur radio. Old-timers can remember when the rules and regulations were accepted as fundamental truths. There were four reasons cited in the rules for the existence of amateur radio as a service and for the setting aside of millions of dollars of spectrum space.

We were supposed to provide a supply of trained technicians and operators for our country in time of war. Indeed, without amateurs, WWII would have been much more difficult. But those were the days when amateurs did keep up with technology. Indeed, they were in the vanguard, inventing and pioneering virtually every major new communications technology.

Today, with most new hams going the Bash route, it is unusual to find anyone with even a vague technical background. In the meanwhile, the technology has rushed years ahead of the average amateur. Many of us were working years ahead of the average amateur. Many of us were working with digital communications over 30 years ago, yet these now-old commercial techniques are still not even on the horizon for amateur traffic nets—which are happily brass-pounding away some fifty years behind the times. How many years has it been since amateurs contributed something to communications technology?

Inventing and pioneering are the purview of youngsters and we hams have grown old and cranky. Few of us have been making any effort to get kids involved with hamming. A distressing number of the ham clubs I've visited in recent years seem to have made it a practice to discourage youngsters from joining.

Okay. Perhaps you can see that if there is going to be any realistic emergency communications system established, we are going to have to have a whole lot more hams than we do today—and they are going to have to be younger and livelier. I can just hear the curmudgeons on 75-meter phone huffing and puffing over that.

You know, I get on 20-meter phone as often as I can spare the time, and it is rare that I run into someone who is *not* retired.

You're still wondering how all this fits in with my FCC petition, right? Well, that has a lot to do with the enormous number of comments filed in response to the no-code proposal—mostly by ARRL-member ham clubs. The gist of these comments was quite consistent: No ham should be licensed without Morse-code skills because these are needed for emergency operating. The old theme of "when all else fails, CW will come through" was said so often that one might think there was some truth in it.

Okay. Let's say that whatever that number of hams agree on actually is the truth—by definition. So if we accept as a fact that we must know Morse code for use in emergency times, then it is inescapable that all hams should be able to demonstrate their competence with the code. The basis for not permitting the FCC to set up a no-code license test on 220 MHz was the need for CW skills for emergencies. So, if the hams who inundated the FCC with these statements were not lying, the logical next step was to see that CW skills are maintained. That's called putting up or shutting up.

My proposal cited the no-code responses. I read through the voluminous report from the Commission when the proposal was terminated. I concluded that the only logical reaction to this massive agreement by the ARRL clubs would be some measure to make sure that hams would not allow these critically-important CW skills to deteriorate and thus not be available when needed.

Further, since the dependence upon CW for emergency communications would pretty much rule out the development of high-speed automatic digital communications such as I have been trying to promote for the last thirty years (yes, I know when I'm licked, and we know that the volume of emergency traffic is incredible), amateurs would be doing their hobby and our country a serious disservice if they did not continue to develop their CW skills to some practical speed level.

During WWII, hundreds of thousands of people were taught to copy CW at 35 wpm—FOX, the Navy called it—also the speed which most of the commercial CW services used to use before they were automated about 40 years ago. Obviously, almost anyone can learn to copy at 35 per, so why not set that as a norm?

Sure, I knew that the same chaps who were so vehement about newcomers having to learn code would be the first to scream bloody murder if anyone suggested that sauce for the goose was sauce for the gander.

The cry would be "grandfather!", right?

Oh, I knew that the FCC would turn down the petition, probably with no good reason given. And I was correct. But I did want to hold the FCC's hand in the fire on this one because they got suckered by a bunch of clubs and old-timers into preventing amateur radio from being able to grow with the times.

On numerous occasions, I have written that I'm not at all sure that it isn't too late to save amateur radio now. A no-code license might have helped, as it did in Japan. But there it hit big so that they have about three times as many licensed amateurs as we have, and with only half our population. Odd, isn't it, that Japan is graduating seven times as many electronic engineers as we are? I wonder where they are coming from? Does anyone have an idea?

Are we going to be able to put together anything significant in the way of an emergency communications system which might possibly survive a nuclear attack? So far, I see not even a hint of hope for this. We need a massive influx of youngsters. We need to get cracking on developing already-known technology so we can have high-speed error-correcting communications which anyone can operate. We need a million new hams, all with the energy and enthusiasm to make all this happen.

I'm still trying to get the concept of ham clubs back into our high schools. I'm working on a high-tech college. My ideas are beginning to be accepted, so we'll see what happens.

Now, about the code. If you really, honestly believe that it is important, then you must agree with me that it is every bit as important to make sure that this key skill is not permitted to deteriorate through disuse. This means retesting.

If you don't agree about retesting, what other way is there to look at it except that code is not critical to getting a ham license? So, are you for code for others, but not you? Code for all? Or no-code for all? Your deal.

WIN WAYNE'S HAMSHACK SWEEPSTAKES WINNERS

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ICOM R-70 SYNTHESIZED GENERAL-COVERAGE RECEIVER
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THIRD PRIZE:
COMMODORE VIC-20 COMPUTER, KANTRONICS INTERFACE HARDWARE AND HAMSOFT SOFTWARE
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D. Joseph Dickinson
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Broomfield CO 80020

Andrew G. Rodau WB3LCN
17 Madison Ave., Apt. 11
Madison NJ 07940

NEW PRODUCTS

COM-RAD'S NEW "UNTENNA"

Development of a new low-profile, vertically-polarized Untenna™ designed to outperform conventional whip antennas more than ten times the height has been announced by Com-Rad Industries of Buffalo NY.

Height reductions of 80% and more alleviate damage caused by garage doors, underground ramps, trees, drive-in or service-station canopies, and other clearance hazards, the company states.

According to Com-Rad, Untennas will benefit a wide range of mobile, portable, and fixed radio users including common carriers, and public-safety, wireless-security-system, government, military, forestry, marine, aircraft, and business/industry vehicles.

Com-Rad reports that, because of Untenna's rigid construction, mobile flutter or "picket fencing" is eliminated, resulting in base-station-quality transmission. Quieter reception with less adjacent-channel interference (intermod) is cited, and gained through Untenna's high Q design. Made of stainless steel, aluminum, phosphor bronze, and chrome plate, each antenna is noted to be highly resistant to corrosion. Unlike whip antennas, the Untenna may be enclosed in an optional weather resistant, high-impact plastic cover (Radome), which is useful also in disguising the antennas.

Untenna is currently available in five models to serve frequency ranges of 25–40, 45–85, 140–170, 210–240, and 430–470 MHz. Combination, single-feed-line models to serve multi-frequency requirements are also available.

Complete information is contained in a new, illustrated bulletin available from *Com-Rad Industries, 25 Imson Street, Buffalo NY 14210.* Reader Service number 480.

HAMTRONICS GAASFET RECEIVER PREAMP

Hamtronics, Inc., has just announced a new low-noise preamp, using a new dual-gate GaAsFET recently designed especially for service in the VHF/UHF bands. Up until now, to get the low-noise figure of a GaAsFET, a designer had to adapt a transistor really intended for microwave service. They work well, but they cost more and the devices tend to oscillate because they have so much gain at the lower VHF and UHF frequencies. Also, being single-gate devices, they tend to have the characteristically high feedback capacitance associated with triodes. This makes them hard to tame under a wide variation in load impedances.

The new LNG-( ) series of preamps solves these problems, providing good gain, moderately low noise figure (0.7 to 0.8 dB, depending on band), and low cost. The LNG-( ) series preamps cost much less than the earlier type of GaAsFET preamps. GaAsFETs typically give a wide dynamic range for good overload characteristics, and this unit is no exception. Additionally, the new dual-gate devices used in the LNG have built-in diode protection to reduce the chance of damage due to static and transients. Units operate on standard +12 to +14 V dc, and they are easy to tune. The case allows for easy mounting anywhere, including the tops of towers. LNG preamps are available for all ham bands, 10 meters through 450 MHz.

For more information, including a free catalog on other Hamtronics products, contact *Hamtronics, Inc., 65 Moul Road, Hilton NY 14468-9535; (716)-392-9430. (For overseas mailing, please send US$2.00 or 4 IRCs.)* Reader Service number 482.

HAMWARE PROGRAMS FOR THE VIC-20

Three new HAMWARE programs by John Vesty Company are said to extend the utility of VIC-20 computers to logging and QSO operations.

HAM LIST serves as a memory jogger during a QSO, quickly searching for a call and displaying data on file. The program provides for the convenient addition, revision, or deletion of entries, and a screen-review of the list.

QUICK LOG provides automatic logging of date and time, and search by call or QTH. The list can be printed, saved to tape, or screen-reviewed as desired. Time is displayed on the menu page.

QSO MANAGER combines a ten-minute identification timer and a 24-hour clock, with a screen-based notepad for use during a phone or CW QSO. The notepad incorporates a word-wrap routine to eliminate broken words at the end of a line. The timer can be set, reset, or cancelled at any time.

The three programs are available on tapes, and are designed for use with both unexpanded and expanded VIC-20 computers. Capacity of the logging programs ranges from 100 to 700 entries maximum, depending on the memory expansion used and the length of individual entries.

For further information, contact *John Vesty Company, 415 Elm Street, Fayetteville NY 13066.* Reader Service number 483.

LARSEN INTRODUCES CELLULAR ANTENNAS

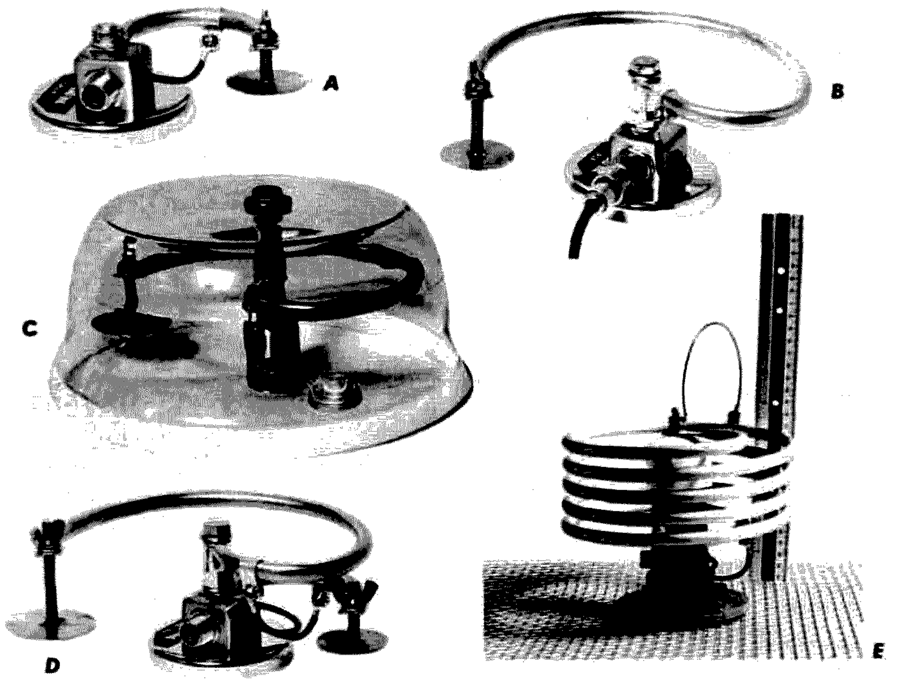
Larsen Electronics has introduced a new line of cellular antennas with a wide choice of cosmetic and mounting options. The Larsen CM series is available in gain and quarter-wave models.

The new CM-825 5/8 over 1/4 wave features an open-coil design that delivers 3-dB gain and a 90-MHz bandwidth. The base is chrome plated, while the whip has the exclusive Kulrod plating. The BCM-825 offers the same electrical configuration with a Teflon™-coated base and rod. Both are shipped with black and white plastic bases to give customers a cosmetic choice.

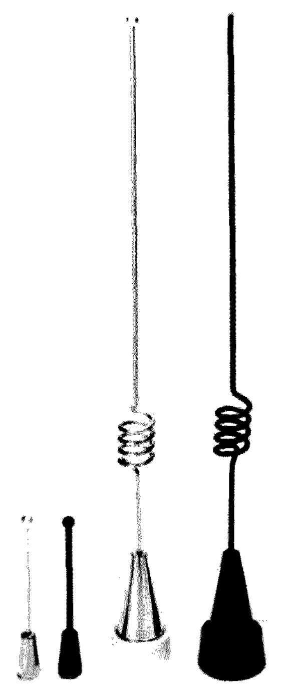
Larsen also offers CM-series quarter-wave antennas with chrome (CMQ) and black Teflon (BCMQ) finishes. The quarter-wave models provide a 90-MHz bandwidth and deliver unity gain with a compact 3" whip.

Larsen's new cellular system offers a choice of weatherproof mounting options. The CM-K/CM-B permanent mount requires a 3/4" hole or the antenna may be mounted temporarily with a mag mount or trunk-lid mount. All are available with RG-58/U or Teflon TFE low-loss coax and TMC connector. The CM permanent mount also is available with low-loss AA-3096 coax and TMC connector mount. Other connector types are available.

For more information, contact *Larsen Electronics, PO Box 1799, Vancouver WA 98668; (206)-573-2722.* Reader Service number 485.



Com-Rad Industries' Untennas. A. Model CR4A, 450–460 MHz; B. Model CR2A, 140–170 MHz; C. Optional Radome Model CR2RD (fits Untenna Models CR2A, CR3A, CR2/4A); D. Model CR2/4A dual-function, multi-frequency Untenna, 140–170 MHz, plus 440–460 MHz; E Model CR109A helical, 29–35 MHz.



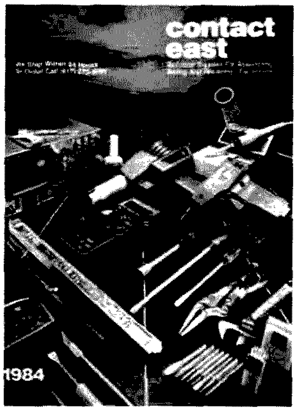
Cellular antennas from Larsen Electronics.

CONTACT EAST FREE 1984 CATALOG

Contact East is offering a free 1984 Electronic Tool and Test Instrument Catalog featuring over 5,000 quality technical products for assembling, testing, and repairing electronic equipment. This is an excellent buying guide for engineers, technicians, and researchers.

Products include precision hand tools, test instruments, tool kits, and soldering supplies, plus a new, full selection of static-control products. All products are fully illustrated with photographs, detailed descriptions, and pricing to allow for easy ordering by phone or mail. Most orders are shipped within 24 hours and carry a 100% satisfaction guarantee.

The Contact East 1984 Catalog is available from *Contact East, 7 Cypress Drive, PO Box 160, Burlington MA 01803; (617)-272-5051.* Reader Service number 478.



Free Contact East catalog.

S. E. CORPORATION'S PROTOTYPING BOARD

The "eZ Board" is a solderless experimenter system which provides a time-saving and convenient method for building experimental add-ons to interface with personal computers.

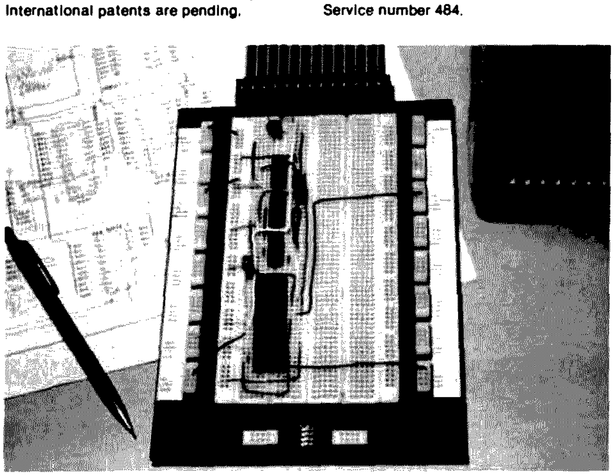
Features include a high-quality glass epoxy printed circuit board mounted with a set of solderless breadboarding units for building circuits. Four separate distribution buses with 50 tie points each can be used for power, ground, clock lines, reset commands, and more. A four-position DIP switch is mounted on the board. Each switch position connects to a set of tie-point-block sockets on either side, to aid in the development and analysis of experimental circuits. A flat ribbon cable connects the board to the computer's bus-expansion slot.

The breadboarding area consists of 1460 tie points with a capacity of sixteen 14-pin DIPs. Components with lead diameters of up to .032 simply plug in and are connected with ordinary solid hookup wire.

The board will be very useful in R & D for engineers, hobbyists, and students who wish to build their own interfaces to computers. It aids in understanding the operation of a computer's bus system and provides the function of each output terminal of the bus for use in developing add-on circuits for interfacing to a computer.

Models IPC, APC, and CPC are available for IBM-PC, Apple, and Commodore and all other hardware-compatible computers of the same type. Models for other computers will be introduced during 1984. International patents are pending.

For further information, contact *Mr. Rahim Sabadia at S. E. Corporation, PO Box 1132, Yorba Linda CA 92686; (714)-630-9335.* Reader Service number 476.



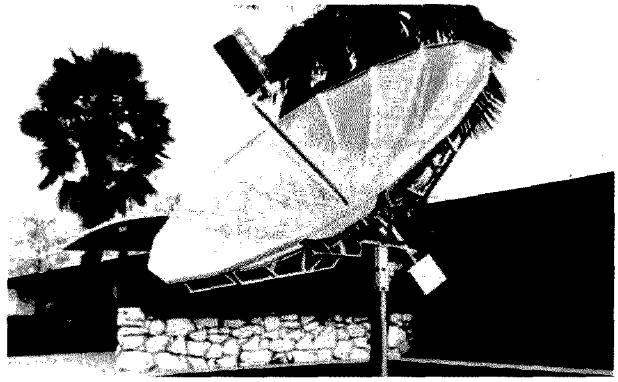
The eZ prototyping board.

AMATEUR RADIO GETS ITS VERY OWN GAME!

The Dayton Hamvention 1984 saw release of Amateur Radio's first official game product, called Hamfest!® 1984. It is produced and distributed by QCD Marketing Services, a division of QCD Publications, Inc., which publishes the ATV journal, *A5 ATV Magazine.*

Hamfest! has its own game, colorful game board, dice, money, and drawing cards. Players move around the game board buying as much ham-radio-type equipment as they can afford while trying to advance themselves from Novice- to Extra-class FCC license. Along the way, there are helping QSL cards and penalty QRM cards. Two squares are designated FCC test areas from which each player draws special FCC cards to determine whether or not he studied hard enough to pass to the next grade license. An additional two squares designate Hamfest locations from which all players begin a trade/buy/sell limited time period. There is a bank and retail store with the first player reaching the Extra-class status declared Super Ham and the winner!

Hamfest! is available at most ham-radio retail dealers or is available direct from *QCD Marketing Services, PO Box H, Lowden IA 52255; (319)-944-5421.* Reader Service number 484.



The KLM Electronics, Inc., satellite Mini-X dish.

KLM'S SATELLITE MINI-X DISH

KLM Electronics, Inc., has announced the introduction of its new Mini-X satellite TV antenna, a parabolic dish with an 8-foot diameter to meet the needs of home or commercial users with limited space.

The Mini-X is the third entry in KLM's line of modular, radar-mesh, parabolic dishes. Its modular design permits fast shipment and easy assembly even by amateurs using simple tools. The smaller, lighter, Mini-X can be assembled by two people in 1½ hours or less or by 1 person in about 2 hours.

The Mini-X employs the same basic modular design as KLM's X-11 and X-16 antennas, with the same survival capabilities against the elements, including the ability to withstand 100-mph winds. It has 16 ribs compared to 24 for the 11-foot X-11.

The Mini-X operates at 55% efficiency, like the X-11. Its f/d ratio is .34 compared with .47 for its larger cousin. It is available with a low-cost, manual-type mount or with a KLM polar mount and tangential drive compatible with KLM motor drives. The Mini-X can be ordered in dark green, black, or brown.

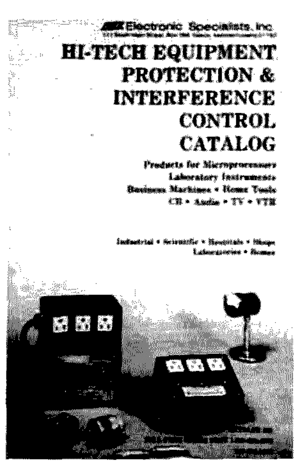
For further information, contact *KLM Electronics, Inc., 16890 Church Street, Morgan Hill CA 95037; (212)-986-6668.* Reader Service number 479.

ELECTRONIC SPECIALISTS' HAM GEAR PROTECTION

Protection and interference control products are presented in a new 40-page catalog from Electronic Specialists. Costly damage from lightning or power-line spikes can be prevented, and disruptions or interference from power-line-carried EMI and RFI can be controlled. Protective devices for ham gear include ac line-voltage regulators and conditioners, modem and phone-line surge suppressors as well as equipment isolators and filter/suppressors.

Typical protection and interference problems are described, together with suggested solutions for various ham and communication installations. Catalog 341 also describes numerous applications for hi-tech equipment protection and interference control.

For further information or to obtain, write *Electronic Specialists, Inc., 171 South Main St., PO Box 389, Natick MA 01760; (800)-225-4876.* Reader Service number 481.



Electronic Specialists' catalog of ham gear protective devices.

THE MCM ELECTRONICS DMM/DCM METER

MCM Electronics, a parts and accessories distributor to the electronic service industry, has introduced the Tenma combination DMM/DCM meter with hFe transistor-gain tester. Users can easily read voltage, current, resistance, capacitance, and hFe on the clear ½-inch, 3½-digit LCD display. It saves time and money by eliminating the use of both a conventional capacitance and a multimeter.

Lightweight and compact for use in the

The MCM Electronics DMM/DCM meter.

field or on the bench, the meter's in-line push-buttons allow for easy one-hand operation.

The capacitance-measuring socket gives direct measurements of capacitors, along with a transistor hFe. The color-coded panel allows users easy identification of function and range settings.

Safety features include input overload protection, single fusing (with spare fuse inside), and stress relief test leads. The Tenma combination DMM/DCM meter comes in a convenient carrying case, with alligator-clip hFe leads, and has a one-year warranty. Battery-operated, the LCD display indicates low battery condition. To get further information or to order, with 24-hour delivery, call toll-free *(800)-543-4330 (in Ohio, (800)-762-4313).* Reader Service number 477.

REVIEW

TRIO-KENWOOD TW-4000A

Trio-Kenwood unveiled the TW-4000A at the 1983 Dayton Hamvention, and that is where I got my first look at one. The model on display had the optional VS-1 voice synthesizer installed, and after a few minutes playing time, I decided that I had to have one. In fact, I didn't get around to purchasing one until that fall. The local ham-radio store, R & L Electronics, let me play with a powered-up unit and demonstrated features and the various options that they stocked. I'm sorry, but you just can't get that kind of service through an 800-number purchase. I ended up going home with the TW-4000A, the VS-1, and the MA-4000 dual-band mobile antenna.

The "FM Dual-bander," as Kenwood likes to call it, is just that. Capable of transceiving on either 2 meters or 440 MHz, it outputs a respectable 25 Watts on both bands. It is one of the very few rigs on the market capable of more than 10 Watts output on 440. My own unit actually measured about 30 Watts on both bands with a Bird® wattmeter.

A long list of other main features includes: a large, easy-to-read liquid-crystal display, an included MC-48 touchtone™ microphone, battery backup (nice when you take that rig into the house at night), priority watch which switches the receiver back to channel one for one second out of ten to watch for calls, and dual vfo's.

The TW-4000A has three main options available. These include the VS-1 voice synthesizer, the TU-4C Continuous-Tone Coded Squelch System (CTCSS) tone encoder, and the MA-4000 dual-band mobile antenna. The VS-1 voice-synthesizer board came in a painfully small box but included a complete set of instructions for installation and use (in two languages). English and Japanese, as if you hadn't guessed. Installation went smoothly, as per instructions, and left me with an excess board containing the previous beeper circuitry. I kept mine... I don't know why. The VS-1 speaks in two languages (go ahead, try to guess) at three speeds. The English voice has an accent of distinctly Japanese female extraction, but it is easily understood. The flip of a switch gives you the same vocabulary in Japanese, to the great delight of guests and children. Watch out for those kids, though; it takes them only a short while to pick it up and they'll be driving you nuts in Japanese. A switch is located on the bottom of the rig that allows you to turn off the voice synthesizer when desired. This is an important feature when on long trips and the XYL is trying to sleep or when she's driving and you want to wander the band without distracting her.

The MA-4000 dual-band antenna is an interesting affair. On 2 meters it is a center-trapped 5/8 wave. On 440 MHz, however, the trap phases two ½ waves in collinear form. Yeah, I know. You've gotta see it. The base of the antenna contains the equivalent of a PL-259. This unique feature raises all kinds of interesting mounting possibilities... and problems. A magnetic mount is available and it is quite strong. Personally, I am a fervent believer in permanent-mount antennas but could find no mount of that configuration. So, I improvised. Those who cringe at the thought of drilling holes in an automobile body should shield their eyes. I found a slightly-longer-than-usual SO-239 socket, drilled a hole in the center of the roof to fit, and tightened a nut down on an "O" ring purchased from a local hardware store. This arrangement has served me faithfully with no leaks for six months. The TU-4C programmable tone encoder is also accessible from the bottom of the radio and allows the setting of one tone each for both VHF and UFH. The TU-4C will generate any of the 37 standard subaudible tones by setting a DIP switch according to the chart included in the owner's manual.

Now a word about whistles and bells. You know, those little features that make or break the long-term ownership of the rig. The dimmer switch dims the display for night driving (you'd be amazed at how bright it is otherwise!). The "scan" feature is always nice when you're bored or on the open road. "Skip" allows the memory scan to bypass unwanted channels. "Reverse" lets one check the input of a repeater to assess simplex possibilities. The microphone-monitoring feature provides a visual indication on the liquid-crystal display as to whether or not your mike or touchtones are working. The owner's manual is extensive and quite complete.

Then comes my pet peeve with many rigs—the included schematic. The schematic diagram that comes with some rigs is either so small that you need a photo enlarger to read it or is spread among several pages of a booklet, preventing easy interpretation. The person that drew the schematic for the TW-4000A should get a pat on the back and a raise. Drawn on both sides of a nice big 16" × 23" sheet of paper, it is well marked and easy to read. The interconnect lines are spaced 60 thousandths of an inch. This is a considerable improvement over the more common 20-thousandths spacing, especially when ten or so of these lines run parallel for any distance. The PLL unit and MC-48 microphone are drawn on the back in nice open lines. Regrettably, as with many other Kenwood radios, no schematic diagram of the microprocessor unit is provided. For those that never work on their own radios, this is of little consequence. Each of these features by itself is not enough to recommend a radio, but altogether they are a formidable package.

The Kenwood TW-4000A is far and away the best mobile rig I've ever owned and, for the person interested in FM only, it makes a very respectable home station as well.

For more information, contact *Trio-Kenwood Communications, 1111 W. Walnut, Compton CA 90220.*

Robert W. French II N8EHA
Lawisburg OH

THOMPSON SOFTWARE MORSE-CODE TRANSLATOR

Outstanding. That is my overall assessment of the new program offered by Thompson Software. The Morse-Code Translator decodes CW and scrolls the output from right to left on a single line across the monitor screen. Input is direct from the receiver headphone jack to the Timex 1000 computer earphone connector. No terminal unit, hardware modifications, or special attachments are needed. What's more, the program also generates CW and sends it via the microphone connector. The best part (aside from the price) is that the program fits into the 2K memory of the unexpanded Timex 1000. I have not tried the program in the Sinclair ZX-81 or the Timex 1500; however, due to their similarity to the model 1000, I suspect that there would be no compatibility problems.

The translator decodes letters, numbers, and 18 other characters (such as $\overline{AR}$, comma, period, etc.). To use the program, load the cassette in the normal fashion; the program is self starting. A brief copyright notice appears on the screen and then the receive mode, shown in Fig. 1, appears. By entering a period, the screen switches to the format in Fig. 2, the code-speed input. Once selected (the range is 9 to 100 wpm), the screen switches to Fig. 3, which gives the option of sending or receiving.

I have confined myself to CW reception; sending requires an audio amplifier connected to the computer microphone port. Reception has been a very pleasant surprise. The computer does an excellent job of scrolling the translated CW on a single line, a total of 32 characters wide.

I listened on 15, 20, 40, and 80 meters and found the reception very good even in noisy situations. My receiver was a Ten-Tec Argonaut with a Murch dipole. I then switched to my Sony ICF 2001 to poke around the SW bands, looking for commercial and government CW stations. I found several and had no trouble with the translating. Computer-generated noise was barely noticeable on the Ten-Tec but was somewhat obtrusive on the Sony. Reception was always very good when proper CW spacing was found. Sloppy fists resulted in the scrolling of various "E" and "T" characters. The old adage, "garbage-in, garbage-out," is very clearly demonstrated in the Thompson Translator. See Fig. 4 for a sample of the output when in the receive mode.

The program has been copyrighted and cannot be discussed in any detail. However, it is similar to many other Timex 1000 CW programs previously published in both *QZX* and *QEX* newsletters. The first line is a REM statement that contains the machine language. Typically, ML is loaded by means of a short routine that is subsequently deleted before using the program:

```
FOR I = 16000 TO 17000
INPUT N
POKE I,N
NEXT I
```

The balance of the program is devoted to the formatting of the screen, selecting the CW speed variable, and various timing and USR commands. This is an elegant little program that does a great job with little memory.

Why use the Timex 1000 computer for CW reception when there are so many alternatives? My reason is the low cost of the unit. Available options include a dedicated microprocessor like the HAL RTTY unit or a code reader like the Microcraft CODE*STAR or an MFJ terminal unit for a home computer. All of these cost far more than my calculator-sized Timex. Originally priced at $150, this computer can now be purchased for as little as $9.95 on special sales. With something like 750,000 units in circulation, it should be no problem to acquire one secondhand. I bought mine for $15.00 at a flea market.

There are several options for CW reception with the Timex 1000. The cream of the crop is the "CWSS" split-screen CW transceiver package that includes a program and hardware from NU4V. Priced at $90, this unit is reported to be an excellent performer. It comes in a kit that must be assembled and plugged into the rear of

Fig. 1.

Fig. 2.

Fig. 3.

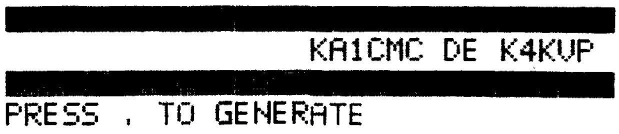


Fig. 4.

the computer. A simpler method requires a knowledge of transistor-to-transistor logic and the assembly of a terminal unit. This can be connected to pin 20 of IC1 of the Timex computer, and with the right software, it will do a good job of receiving CW. I zapped an IC with some ill-advised modifications of this sort. Static electricity does not mix with ICs very well. The Thompson Translator ($9.95) is the cheapest solution that I have encountered. Input via the microphone port is directed to pin 20 of IC1 without requirement of major surgery on the computer.

All in all, I give very high marks to the Thompson Software CW Translator and recommend it without reservation. I hope that the Thompson staff is hard at work on a RTTY program. Both programs would be welcome additions to Timex software libraries. For further information, contact *Thompson Software, PO Box 1266, Lombard IL 60148.* Reader Service number 486.

Thomas Hart AD1B
Westwood MA

REGENCY Z30 SCANNER

The Regency Model Z30 is a full-feature scanner that should appeal to those requiring maximum operator flexibility. Covering the three FM bands, the Z30 features 30 programmable channels and a host of features provided by microprocessor control. A clock and alarm clock are included. Although designed for home use, the monitor can operate in a mobile environment using a provided 12-V power connector. A telescoping antenna is included with the unit, and although fine for normal use, a connector is provided for an external antenna.

As soon as I unpacked the Z30, I was impressed by the layout of the controls. Unlike some devices with keys so small a pencil tip is required equipment, the Regency features a full-size, 24-key touchpad and power, volume, and squelch controls. Setting frequencies is a snap. Programming the frequency of a local repeater was accomplished by first depressing the MANUAL button. A loud "beep" announces contact closure in no uncertain terms. The display (of the bright-green vacuum-fluorescent type) indicates the channel number being programmed—in my case "CH 01". The desired frequency is then entered digit by digit on the keypad. Any programming mistake is easily fixed by using the CLEAR button and reentering the numbers. I managed to correctly enter 147.375. Depressing ENTER associates the channel and frequency. No band-switching is required, as any frequency within the three bands can be associated with any channel. All 30 channels are programmed in similar fashion. A DISPLAY button allows the user to immediately identify any of the 30 possible channel-frequency relationships. Any errors or incorrect control sequences are indicated by English-like error messages created by the microprocessor.

The Z30 supports all popular scanner functions. Hidden frequencies within a band are isolated easily using the SEARCH function. The upper- and lower-frequency ranges of the search are entered using multipurpose keys. After depressing SCAN, any reception within the bounds locks the receiver and the frequency is displayed. Two options may then be employed. If you are like me, it takes a few moments to write down a new frequency. A DELAY function causes the Z30 to hold for four seconds after carrier disappears before scanning is resumed. If you like what you hear on a new channel, depressing HOLD keeps you there. Searching is terminated at any time by using any other function key.

A favorite channel may be checked every two seconds for activity by programming it into CH 01 and activating the PRIORITY function with a single keystroke. A simple scan of preprogrammed channels is initiated by depressing SCAN. A DELAY option holds each reception for two seconds after transmission to allow responses to be heard. A single channel is continuously monitored by selecting the CH with the MANUAL button.

All in all, I found the Regency Z30 easy to set up and understand. Regency did not overlook receiver performance in this design. Some of the allband, fully-synthesized machines function well on one band and suffer on others. Since the Z30 owner's manual actually published specifications for the bands 30-50 MHz, 144-174 MHz, and 440-512 MHz, we decided to check some of them. A friend who is a repeater owner/operator provided the equipment and expertise required to run accurate tests. Receiver sensitivity (12 dB Sinad) exceeded the published figures of .35 uV at 40 MHz, .4 uV at 160 MHz, and .5 uV at 465 MHz by comfortable margins. Operating a 2-meter hand-held in the same room did not cause the entire middle band to go dead. Squelch action is crisp and the audio quality is acceptable. A list of synthesizer "birdies" is provided in the owner's manual. On my sample, some were present, but at least the owner is forewarned.

The Z30 package is rounded off with a programmable time-of-day clock and alarm clock. These clocks are programmed via the keypad. The alarm, when it sounds, is very loud, unmelodious, and guaranteed to wake up anyone. (I'll bet on that!) A DIM switch allows the normally-bright display to be dimmed or turned off altogether at night. A capacitor backup system is claimed to hold all programmed functions for a week when ac power is absent. I didn't test this function as I play with my Z30 daily, but no data was lost while transferring the unit to my car.

I have two units with the Z30. The base plate for the touchpad is a baked, metallic-brown color. The numbers and functions printed by the keys are almost unreadable under dim or indirect illumination. The "beep" tone used to verify key closures and for the alarm clock is unnaturally loud and harsh. However, the features and performance of the Z30 outweigh these minor problems. The 20-page operator's manual is complete and understandable. Full technical specifications, troubleshooting guide, and "national frequency list" are included.

For additional information, contact *Regency Electronics, Inc., 7707 Records St., Indianapolis IN 46226-9986; (317)-545-4281.* Reader Service number 467.

John Molnar WA3ETD
Greenfield NH

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

Okay, so that's one! You see, as I begin the eighth year of this column, I have to admit to making a mistake. I don't make many here, but this one is a doozy. Thanks and a tip of the cap to Ed Duellman K9FWR, Duane Vincent KA7JEX, and the countless others who will no doubt write between the time I write this month's column and when it sees print.

To explain, in the April column I discussed hooking a Murray-encoded teleprinter to an ASCII port of a computer, in that case, a Texas Instruments TI-99/4A. The problem was that I was referring to a Teletype Model KSR-35 as a Murray machine. It is not. The Model 35 is a 110-baud ASCII machine. The problem arose in my scribbled note to myself, wherein I changed the "35" to a "32". The Model 32 is the Murray version of the commonly found Model 33, which is also an ASCII machine.

So, if you all will take a pencil to your April issue and change the reference to a Model 35 to a Model 32, all will come out all right. No, this was not an intentional April Fool's joke, although it seems to look like one. And, fortunately, the general ASCII-to-Murray discussion of last month remains unaffected.

As I mentioned above, this is the start of the eighth year of RTTY Loop. Because we have picked up a good number of readers in the last few years, I think it is time to review some general points that may be confusing to the newcomers.

What is RTTY? "RTTY" stands for radioteletype, a mode wherein amateur-radio communication is maintained using signals decoded to activate various kinds of teleprinters or computers.

What kind of printers or computers? Some of the pioneering work in RTTY was done with teleprinters which look like the ones you see in newsroom photos of the 1950s. Various designations are given to them, most of them relating to Teletype Corporation model numbers. After a period of slow growth, where mostly mechanical teleprinters were in use, RTTY is now going through a boom with the arrival of microcomputers. Software, that is, programs, are available for about any home computer to turn it into a RTTY terminal.

What do you talk about? Well, what do you talk about on ham radio in general? Sure, topics include the equipment you are running, the weather, and the usual run-of-the-mill stuff. But, since today's RTTYers are likely to be in the forefront of digital technology, computers and the like are also active topics. Not only that, but RTTY stations also can send long texts such as messages, programs, and the like, and, especially around holidays, some of the famous RTTY pictures.

Where can I find a RTTY station? Still popular after all these years, look for the doodle-do of RTTY signals around 3520 kHz or 14080 kHz. There are other spots, and you may even find a local two-meter repeater with a RTTY net.

How much will it cost to get on RTTY? How much does a car cost? You can probably locate an old teleprinter around for a few dollars. Simple AFSK generators and demodulators have been published here and will be published in the future as new designs appear. Or, if you have a microcomputer such as a CoCo or any of the 6502 machines, a sawbuck or two should bring you enough programming to put that machine on the air. It's clearly not out of reach for most hams.

Where can I find out more? You knew there had to be a point to all of this, right? Well, you are holding, in your hand, a potent source of RTTY information. Keep reading *73*, keep reading RTTY Loop, and you should be able to get all the information you need.

I was not kidding about the bargain machines, folks. As I write this column, I am recovering from a day at the Greater Baltimore Hamfest and Computerfest. Next month I hope to print a few photos of the sights. Deadline precludes getting the film processed this month, but let me tell you—Model 15 and Model 33 teleprinters were being sold for less than fifty dollars, some for much less! The computer displays, tables and tables of them, often showed RTTY programs available. The tide is turning, ladies and gentlemen, and RTTY is growing faster then ever!

I have a letter here from Eric W. Davenport N4DTE who is using a 6809-based microcomputer under the FLEX operating system and is looking for a RTTY program to use on that computer. Well, Eric, I have looked around and, sorry to say, can find nothing that would support the system you are using. That is not to say it does not exist, though, and if any readers are using such a system on RTTY, I would be happy to hear about it and will pass the information along to Eric. One source you might try is *'68' Micro Journal*, a monthly magazine devoted to the 68xx series of computers. They lean toward FLEX and 6809s, so it sounds like your league. You can subscribe for one year by sending $24.50 to *'68' Micro Journal*, 5900 Cassandra Smith, PO Box 849, Hixson TN 37343. Be sure to drop my name, ok?

One more ham who has found happiness with a TI-99/4A is Paul Schmidt W9HD. Paul passes along his comments, with the note that his computer is on the air with the aid of the Kantronics Hamsoft program and the AEA CP-1 "Computer Patch." He enjoys operating RTTY, but I have to pass along his last few lines. You see, Paul works as a radio operator on a supertanker, and he writes, "By the way, I'm not too enthusiastic about AMTOR. On the ocean, we have SITOR and MARISAT. On this ship, we have neither one. I send my traffic a letter at a time on CW. How about that?" Thanks, Paul, and I do appreciate the comments.

Here is another letter from a ham trying to put yet another kind of computer onto RTTY. John A. Palese, Jr. WB9JPH/5

writes several questions. The first seeks the existence of a program to place an Osborne 1 on the air on Morse, Murray, and ASCII. Well, the last one is easy, John. Any terminal program, such as the public domain MODEM7, will do fine to produce ASCII. I have not seen anything on the boards for RTTY or CW, but I'll keep my screen clean and looking.

John's next question shall be paraphrased for obvious reasons. "What do you think of the Milchig computer with a Fleischig interface for use on RTTY?" Unless I have seen the combination in question, there is no way I can answer the question! As a rule, any reputable product appears to be functional. I have received very few "lemon" reports, and those I try to pass along as best I can here in the column, usually quoting the reviewing amateur directly. I would encourage you to look around to see if you can play with someone else's system in your area before you buy. I don't know that I would base the purchase of a particular microcomputer on the desire to run RTTY, however. It is rapidly appearing that any one of the "consumer" line has supporting software.

So you see, my overall advice if you want to run a computer on RTTY is to first pick the computer. Pick it for what it can do within, and without, amateur radio. After all, a computer is too powerful a tool to limit to one use only. For that you could get a dedicated terminal. Then look for software and interfaces that appeal to you. Believe me, whatever I have seen I write about. If I have not written up a particular program or interface, it is not necessarily because it is bad; I probably have not had any hands-on exposure to it. And as stated here before, I won't write up an item based on a press release unless there are extenuating circumstances. I have done that in the past and we all got bitten—no more!

Hope that helps you out, John, and thanks for the note.

Because of the two-month delay between the time I write this column and publication, I am dragging my feet this month on the information sheet mentioned last month. I want to see what the response is and attempt to react accordingly. So I am still offering the first of several planned information sheets on RTTY. Simply send a self-addressed, stamped envelope or sufficient US funds for postage to foreign stations with $2.00 to the above address for the first sheet, an elementary introduction to RTTY. If the demand keeps up, sheets will be introduced to cover many of the elementary topics discussed in past columns.

Next month will include a look at the recent hamfest, if the pictures come out, and more of this and that. Let me hear from you, then look for your name here, in RTTY Loop.

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

BASIC COMPUTING

If you're a forward-thinking ham (as opposed to those lids who devote their lives to repeaters and rag-chew nets), you probably own a microcompter. But do you ever actually program your machine? Probably. But odds are that you get more use out of canned software than your own creations.

As my dear friend Doctor Digital always says, programming is fun. That may be true. But which language is best?

Basic is by far the most popular micro language. Basic in ROM is a standard feature on most personal computers. Still, its awkward syntax and arcane structure make it a clumsy language to use in all but the most simple (dare I say basic?) applications. Pascal is much nicer, but has been slow to catch on. Everyone likes Pascal, but few actually seem to write software with it. Assembler is better yet, but is much too complicated for newcomers to handle.

So we're stuck with Basic. All in all, it's not an impossible language to work with, given its inherent limitations. More than one Field Day logging program has been written in this language and I suppose hams will continue to use Basic for years to come.

This month, for better or worse, FUN! looks at the world of Basic. GOTO Element 1.

ELEMENT 1
MULTIPLE CHOICE

1) The original form of Basic is known as:
   1) Dartmouth Basic
   2) Princeton Basic
   3) Original Basic
   4) Basic Basic

2) Which of the following Extended Color Basic commands tells a Radio Shack TRS-80 Color Computer to send sound through a TV speaker?
   1) SOUND ON
   2) SPEAKER ON
   3) AUDIO ON
   4) TV ON

3) Who invented Basic?
   1) Stan Wright and Herb Anderson
   2) Frank Sullivan and Steven Klein
   3) Thomas McIntire and Steve Jobs
   4) John Kemeny and Thomas Kurtz

4) What function does the system command CALL – 151 serve on an Apple II?
   1) Puts the computer into the monitor mode
   2) Initializes slot 1
   3) Activates the computer's 80-column card
   4) POKES the decimal value 151 into memory location 16789

5) What function does IPL serve on Radio Shack's Model 100?
   1) Automatically executes a specified program as soon as the computer is switched on
   2) Sets the computer's real-time clock/calendar
   3) Initializes the 300 baud modem
   4) It serves no purpose

6) The Commodore 64 comes with how many bytes of random-access memory?
   1) 16K bytes
   2) 32K bytes
   3) 48K bytes
   4) 64K bytes

7) CP/M is:
   1) A language
   2) An operating system
   3) A local area network
   4) A popular word-processing program

8) PRINT USING:
   1) Is not a Basic statement
   2) Tells the computer to print strings using a non-ASCII format
   3) Prints numbers or strings in a variable format
   4) Is a standard part of Applesoft Basic

9) LLIST, in Microsoft Basic:
   1) Prints listings lengthwise
   2) Cannot be used as a program statement
   3) Sends a listing in memory to a printer
   4) Prints listings twice

10) On a TRS-80 Model III, PRINT@:
   1) Would print the character "@"
   2) Tells the computer to print a character at a specific point on the video display
   3) Is never used
   4) Tells the computer to output to a printer

ELEMENT 2
TRUE-FALSE

Separate the working from the non-functional Basic program lines.

	True	False
1) 10 ? "HELLO"	____	____
2) 10 C = A PLUS B	____	____
3) 10 LET A = B	____	____
4) 10 FOR I = 1 – 5	____	____
5) 10 A + B = C	____	____
6) 10 C = A × B	____	____
7) 10 IF B = C	____	____
8) 10 GOTO	____	____
9) 10 INPUT 10	____	____
10) 10 PEEK 16789	____	____

ELEMENT 3
SCRAMBLED WORDS

Unscramble the following Basic commands and statements:

UNR	TISL	RITPLN
PUINT	BUGOS	EWN
LAREC	HENT	POST
DNE	FENTID	MID

ELEMENT 4
FILL IN THE BLANK

1) Many Basic programs use a _____/NEXT loop.
2) Every RETURN must have a _____.
3) Programmer comments are contained in a _____ statement.
4) IF A = 20 _____ 50
5) To get a result from READ, one must supply at least one _____ statement.

THE ANSWERS

Element 1:
1—1, 2—3, 3—4, 4—1, 5—1, 6—4, 7—2, 8—3, 9—3, 10—2.

Element 2:

1—True	The question mark will work as a PRINT statement or command on most personal computers.
2—True	But never A + B = C.
3—True	LET is optional, but you can toss it in if you want to waste memory.
4—False	TO, not "–", is what works.
5—False	See question 2.
6—False	Multiply with "*" not "×."
7—False	Not a complete statement. Toss in a THEN.
8—False	No line number specified.
9—False	Needs a variable.
10—False	Memory address must be in parentheses.

Element 3:
RUN, LIST, LPRINT; INPUT, GOSUB, NEW; CLEAR, THEN, STOP; END, DEFINT, DIM.

Element 4:
1—FOR
2—GOSUB
3—REM
4—THEN
5—DATA

SCORING

Element 1:
Two and one-half points for each correct answer.
Element 2:
Two and one-half points for each correct answer.
Element 3:
Two points for each word unscrambled.
Element 4:
Five points for each word correctly filled in.

Have you conquered the basics of Basic?

1-20 points—	Think computers are just a fad
21-40 points—	Think computer prices are still too high
41-60 points—	Happy to run canned software
61-80 points—	A true-blue hacker
81-100 points—	Program in machine code for kicks

HAM HELP

I need a schematic and service manual for the Lafayette BCR-101 shortwave receiver.

Marvin Hees W2WKU
204 Queensway Road
Elma NY 14059

Wanted: Program for the Commodore VIC-20 and/or C-64 computer to allow them to be used as an electronic mailbox (RBBS or MSO) on the air on ASCII and/or Baudot; may be commercial program or home brew.

SSG. Gary E. Kohtala DA2XF
USAFS-A, Box 1418
APO NY 09458

Wanted: An instruction manual for a Leeds and Northrup galvanometer bridge, catalog #4270, serial #1041207. Will gladly pay copying and mailing costs.

Vernon Jones WB1BVH
32 Cat Mousam Road
Kennebunk ME 04043

Can you help me find a book for trouble-shooting radio problems? Especially receivers. I'd like to understand the theory and what to check for with particular symptoms.

Ray Poll
2322 Calumet
Flint MI 48503

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

ARRL VHF QSO PARTY
Starts: 1800 GMT June 9
Ends: 0300 GMT June 11

Sponsored by the ARRL, the object is to work as many amateur stations in as many different ARRL sections and countries as possible using authorized amateur frequencies above 50 MHz.

Operating categories include single-operator using multi- or single band, or multi-operator. Single-operator stations must use one person for all operating and logging functions. Single-operator stations may submit single-band scores for 50, 144, 220, 432, and 1296-and-up categories. Contacts may be made on any and all bands without jeopardizing single-band entry status. Such additional contacts are encouraged and should be reported.

Multi-operator stations must locate all equipment (including antennas) within a 300-meter circle.

Stations may be worked once per band, regardless of mode. Each QSO must be acknowledged; one-way exchanges do not count. Foreign stations may work only stations in the USA, Canada, and US possessions for contest credit.

Retransmitting either or both stations or use of repeater frequencies is not permitted. Contest entrants may not transmit on repeaters or repeater frequencies on 2 meters to solicit contacts. Use of the national calling frequency (146.52) or immediate adjacent guard frequencies is also prohibited. Only recognized simplex frequencies may be used, such as 144.90 to 145.10; 146.49, .55, and .58; and 147.42, .45, .48, .51, .54, and .57 MHz on the 2-meter band. Local-option simplex channels and frequencies adjacent to the above that do not violate the intent of the contest rules or the spirit and intent of the band plans as recommended in the *ARRL Repeater Directory* may be used for contest purposes.

All operation must be fixed, portable, or mobile under one call from one ARRL section. A transmitter used to contact one or more stations cannot be used under any other call during the contest period with the exception of family stations where more than one call is assigned to one location by FCC/DOC. Also, one operator may not give out contest QSOs using more than one callsign from any one location.

Only one signal per band at any given time is permitted, regardless of mode. While no minimum distance is specified for contacts, equipment should be capable of real communications (i.e., able to communicate over at least a mile). Multi-operator stations may not include QSOs with their own operators except on frequencies higher than 2.3 GHz. Even then, a complete, different station must exist for each QSO made under these conditions.

Above 300 GHz, contacts are permitted for contest credit only between licensed amateurs of Technician class or higher using coherent radiation on transmission (e.g., laser) and employing at least one stage of electronic detection on receive.

EXCHANGE:

Name of section, VE province, or DX country. Must be acknowledged by both operators for credit by either.

SCORING:

Count one point for each complete 50- or 144-MHz QSO, 2 points for each 220- or 420-MHz QSO, and 3 points for each 1215-MHz and above QSO. Crossband QSOs do not count.

Multipliers count once per band: each ARRL section in the contiguous 48 states (63 max.), each Canadian province (max. 12), and each OXCC country (excluding W and VE).

REPORTING:

Entries must be postmarked no later than July 11th and sent to the ARRL Headquarters in Newington CT 06111. Official entry forms are available from the same address for an SASE. Usual ARRL disqualification rules apply. Usual awards to top scorers in each ARRL section, some limited to where significant effort or competition is evidenced. Multi-operator entries are not eligible for single-band awards.

SUMMER SMIRK PARTY
Starts: 0000 GMT June 16
Ends: 2400 GMT June 17

The contest is sponsored by the Six-Meter International Radio Klub (SMIRK). No crossband contacts, multi-operators, or partial contacts are allowed. Check logs or dupe sheets are not needed.

EXCHANGE:

SMIRK number and ARRL section, foreign state, province, prefecture, or country. Count ARRL sections in the 48 US states only; KH6 and KL7 count as countries. Washington DC counts as a section as well. Canadians count as provinces; all others count as states, provinces, prefectures, or countries.

SCORING:

Count 2 points for each SMIRK contact, 1 point for non-SMIRK QSOs. Add QSO points and multiply by number of ARRL sections, foreign states, provinces, prefectures, or countries worked for final score.

AWARDS:

Certificates for high-scoring SMIRK in two divisions: US/Canada and foreign. Certificates for high score in each ARRL section and foreign state, province, prefecture, or country.

ENTRIES:

Entries must be submitted on the fall, 1981, edition of the official SMIRK log. Single copies are available for an SASE and photocopies may be used. Send log requests and entries postmarked by July 8th to: Mark S. Anderson WB5NPK, 8932 Saddle Trail, San Antonio TX 78255.

ARRL FIELD DAY
Starts: 1800 GMT June 23
Ends: 2100 GMT June 24

Sponsored by the ARRL, the contest is open to all amateurs in the ARRL Field Organization plus Yukon and NWT. Foreign stations may be contacted for credit but are not eligible to compete. The object is to work as many stations as possible under less-than-ideal conditions. Operating times are limited depending on your operating class; check rules below.

Entry categories are classified by the maximum number of simultaneous transmitted signals followed by the designation of the nature of the individual or group participation. Below 30 MHz, a transmitter must remain on a particular band for at least 15 minutes once used for a contact on that band. During this 15-minute period, the transmitter is considered to be transmitting a signal (even if it is not) for purposes of determining transmitter class. Switching devices are prohibited.

Class A consists of club and non-club portable stations specifically set up for Field Day. Such stations must be located in places that are not regular station locations and must use no facilities installed for permanent station use nor any structures installed permanently for FD use. Stations must be operated under one callsign and under the control of a single licensee or trustee for each entry. All equipment (including antennas) must lie within a 300-meter circle. All contacts must be made with transmitters and receivers operating independent of commercial mains. Entrants who, for any reason, operate a transmitter or receiver from commercial mains for any contacts will be listed separately at the end of their class.

Any Class-A group whose entry classification is two or more transmitters (non-Novice) may also use one Novice/Technician operating position (Novice bands only) without changing its basic entry classification. This station (including antennas) should be set up and operated by Novice and Technician licensees and should use the callsign of one of these operators.

Class B consists of non-club portable stations set up and operated by not more than two licensed amateurs. Other provisions are the same as for Class A.

Class C consists of mobile stations in vehicles capable of operation while in motion and normally operated in this manner, including antenna. This includes maritime and aeronautical mobiles.

Class D consists of stations operating from permanent or licensed station locations using commercial power. This group of stations may only count contacts made with Class A, B, C, and E Field-Day groups for points.

Class-E stations are the same as Class D except they use emergency power for transmitters and receivers. They can work stations in all classes.

Operators participating in FD may not contact for point credit the FD portable station of a group with which they participate. Any station used to contact one or more FD stations may not be used under any other call during the FD period, except for family stations.

Each phone and each CW segment is considered as a separate band. All voice contacts are equivalent, and RTTY/ASCII is counted as CW. A station may be worked once on each band—crossband contacts are not allowed. The use of more than one transmitter at the same time in a single band is prohibited, except that a Novice/Technician position may operate on any Novice band segment at any time. No repeater contacts.

EXCHANGE:

Stations in any ARRL section send Field-Day operating class and ARRL section. A four-transmitter station in NJ would send "4A NJ". Foreign stations send RS(T) and QTH.

SCORING:

Scores are based on the number of valid contact points times the multiplier corresponding to the highest power used at any time during the FD period, plus bonus points. Phone contacts are one point each, CW counts two points each. Power multipliers are: 5 for using a dc input power of 10 W (20 W PEP) or less (or 5-W dc output/10-W PEP output) and if using a power source other than commercial mains or motor-driven generator; 2 for using a dc input power of 200 W or less on CW and 400 W PEP or less on SSB; 1 for using anything higher.

Batteries may be charged while in use for Class-C entries only. For other classes, batteries charged during the FD period must be charged from a power source independent of the commercial mains.

Bonus points will be added to the score (after the multiplier is applied) to determine the final score. Only Class-A and Class-B stations are eligible for bonuses:

CALENDAR

Jun 9–11	ARRL VHF QSO Party
Jun 16–17	Summer SMIRK Party
Jun 23–24	ARRL Field Day
Jul 1	Canada Day Contest
Jul 7–8	YV Independence Worldwide Contest—SSB
Jul 13–15	A5 International SSTV-DX Contest
Jul 14–15	IARU Radiosport Championship
Jul 28–29	YV Independence Worldwide Contest—CW
Aug 4–5	ARRL UHF Contest
Aug 11–12	New Jersey QSO Party
Aug 18–19	SARTG Worldwide RTTY Contest
Aug 24–27	A5 North American UHF FSTV-DX Contest
Sep 8–9	ARRL VHF QSO Party
Sep 15–17	Washington State QSO Party
Sep 22–23	Late Summer QRP CW Activity Weekend
Oct 6–7	ARRL QSO Party—CW
Oct 13–14	ARRL QSO Party—Phone
Oct 20–21	Jamboree On the Air
Nov 3–4	ARRL Sweepstakes—CW
Nov 17–18	ARRL Sweepstakes—Phone
Dec 1–2	ARRL 160-Meter Contest
Dec 8–9	ARRL 10-Meter Contest
Dec 28–Jan 1	QRP Winter Sports—CW
Dec 30	Canada Contest

1) *100% Emergency* Power—100 points per transmitter for 100% emergency power. All equipment and facilities at the FD site must be operated from a source independent of the commercial mains.

2) *Public Relations*—100 points for public relations. Publicity must be obtained or a bona fide attempt to obtain publicity must be made, or operation must be conducted from a public place (such as a shopping center). Evidence must be submitted in the form of a clipping, a memo from a BC/TV station that publicity was given, or a copy of material that was sent to news media for publicity purposes.

3) *Message Origination*—100 points for origination of a message by the club president or other FD leader, addressed to the SM or SEC, stating the club name (or non-club group), number of operators, field location, and number or ARES members participating. The message must be transmitted during the FD period and a fully-serviced copy of it must be included with the FD report. The message must be in standard ARRL message form or no credit will be given.

4) *Message Reply*—10 points for each message received and relayed during the FD period, up to a maximum of 100 points. Copies of each message, property serviced, must be included with the FD report.

5) *Satellite QSO*—100 points can be earned by completing at least one QSO via satellite during the FD period. The repeater provision is waived for satellite QSOs and a satellite station does not count as an additional transmitter. Show satellite QSOs as a separate band on the summary sheet.

6) *Natural Power*—FD groups making a minimum of 5 QSOs without using power from commercial mains or petroleum derivatives can earn 100 points. This alternative power source also includes batteries charged by natural means (not dry cells). The natural-power station counts as an additional transmitter. If you do not want to change your entry class, take one of your other transmitters off the air while making the natural-power QSOs. A separate list of natural-power QSOs should be enclosed with your entry.

7) *W1AW Message*—A bonus of 100 points will be earned by copying a special ARRL FD bulletin sent over W1AW on its regularly announced frequencies just before and during FD. This message can be received directly from W1AW or by any relay method. An accurate copy of the received message should be included in your FD report.

REPORTING:

Entries must be postmarked by July 24th; no late entries can be accepted. A complete entry consists of a summary sheet and a list of stations worked on each band/mode during FD, plus bonus proof. The list of stations worked on each band or mode may take the form of official ARRL dupe sheets or an alphanumeric listing of callsigns worked per band and mode. This list may be computer-generated. Incomplete or illegible entries will be classified as check logs. A copy of FD logs should be kept by your FD group but should not be sent in unless specifically requested by the ARRL. Normal ARRL disqualifications rules apply.

All entries and requests for official forms should be addressed to: ARRL, Newington CT 06111. Include a 9" by 12" self-addressed envelope with 3-oz. postage for a complete Field-Day entry package.

North Florida Amateur Radio Society
Balanced Modulator W4IZ
JACKSONVILLE, FLORIDA ·ARRL·

NEWSLETTER OF THE MONTH

The North Florida Amateur Radio Society's *Balanced Modulator* is consistently one of the best club publications in the nation. In addition to lively editorial commentary and very comprehensive ham news coverage, *BM* also includes Pete Nissen W4PTT's well-done "DX and Other Stuff" column. Two other features—unique and valuable—began with the March issue: a NOFARS member business and services directory and NOFARS assistance and advice network listings. Congratulations, President Billy Williams N4UF and all NOFARS members!

To enter your club's newsletter in *73's* Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

CANADA DAY CONTEST
Starts: 0000 GMT July 1
Ends: 2400 GMT July 1

Sponsored by the Canadian Amateur Radio Federation (CARF), the contest is open to all amateurs and everybody works everybody. Entry classes include single-operator, all bands; single-operator, single band; and multi-operator, all bands. There are also separate single-operator QRP (5-W output) classes for all bands and single band.

Use all bands from 160 to 2 meters on CW and phone combined. All contacts with amateur stations are valid. Stations may be worked twice on each band, once on CW and once on phone. No crossmode contacts and no CW contacts in the phone bands are allowed.

EXCHANGE:

Signal report and consecutive serial number starting with 001. VE1 stations should also send their province (NS, NB, PEI). Do not use a separate series of numbers on each band.

SCORING:

Score 10 points for each contact with Canada, 1 point for contacts with others. VE∅ counts as Canada. Score 10 points for each contact with any CARF official station using the suffix TCA or VCA. Multipliers are the number of Canadian provinces/territories worked on each band on each mode (12 provinces/territories x 2 modes for a maximum of 192 possible multipliers). Contacts with stations outside Canada count for points but not multipliers.

FREQUENCIES:

1810, 1840, 3525, 3770, 7025, 7070, 14025, 14150, 21025, 21250, 28025, 28500, 50.040, 50.110, 144.090, 146.52. Suggest phone on the even hours (GMT), CW on the odd hours (GMT). Since this is a Canadian-sponsored contest, remember to stay within the legal frequencies for your country!

AWARDS:

Certificates will be awarded to the highest score in each category in each province/territory, US call area, and DX country. If scores are close, second- and third-place certificates will be awarded. Additionally, several trophies will be awarded to some top scorers courtesy of sponsors.

ENTRIES:

A valid entry must contain log sheets, dupe sheets, a cover sheet showing claimed QSOs, QSO points, a list of multipliers, and a calculation of final claimed score. Cover sheets and multiplier checklists are available. Entries should be mailed within one month of the contest, with your comments, to: CARF, PO Box 2172, Stn D, Ottawa, Ontario, K1P 5W4 Canada.

Results will be published in *TCA*, the Canadian amateur magazine. Non-subscribers may include an SASE for a copy of the results.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

THE NCDXF 20-METER BEACON NETWORK

Have you been listening on 14100 as I suggested last month? If not, tune your receiver to that frequency as you read the column this time.

What do you hear under all that interference? A strange pattern of CW signals and long dashes from stations all over the world. This is the 20-meter beacon network, constructed by the Northern California DX Foundation (NCDXF).

This network consists of eight automated beacons scattered around the globe. Each beacon transmits on a strict time sequence (see Table 1).

The beacons provide current information on the state of the ionosphere and on radio propagation to various parts of the world, all in less than ten minutes! Let's have a closer look at this network to see how we can use it to best advantage.

The Beacons

Each of the beacons consists of a power supply and controller, a Kenwood TS-130 transmitter, and an omnidirectional antenna. The controller features a quartz-clock accuracy of one part in 10,000,000, a microprocessor to generate the beacon CW identification, and a switching network to reduce the power of the transmitter in 10-dB steps.

0000	4U1UN	United Nations, New York City
0001	W6WX/B	Stanford University, Palo Alto, California
0002	KH6O/B	Northeastern Oahu Island, Hawaii
0003	JA2IGY/B	Mt. Asama, Japan
0004	4X6TU/B	Tel Aviv University, Israel
0005	OH2B	Helsinki Technical University, Finland
0006	CT3B	Madeira Island, Africa
0007	ZS6DN/B	Transvaal, South Africa
0008-9		(silent)

Table 1.

This power reduction is one of the most fascinating aspects of the beacon system. During the 58 seconds that each beacon transmits, its output power drops by a factor of 10 every ten seconds (see Table 2). The final 9-second-long dash, preceded by four dits, is sent at the power level of only 0.1 Watts! And yet you can hear the 0.1-Watt level from several of the beacons.

A Kenwood TS-130 transceiver and a quad antenna comprise the rest of the beacon. The Kenwood transceivers have held up very well under the continuous-duty operation of the beacons; no beacon has ever been off the air for transceiver problems. The antenna is a turnstile made of two quad loops at right angles to each other. This antenna produces an antenna pattern practically omnidirectional in the horizontal plane, and with the pattern favoring low-angle radiation in the vertical plane. Each side of the quad loops is 17' 11" long.

Each beacon package, including antenna, costs about $1300. The Northern California DX Foundation is picking up the tab for this entire project, including the eight beacons in place, and future beacons (see below).

Behind the Beacons

The network is the brainchild of Stanford Research Institute scientist Dr. Mike Villard W6QYT, who has had a long time interest in worldwide radio propagation. With the support of the Northern California DX Foundation and the active assistance of several San Francisco Bay area amateurs, the network began to take shape in the late 70s.

Dave Lesson W6QHS took some time off from his multimillion-dollar Silicon Valley company to design the necessary hardware. His contribution included the overall design of the network along with the details of the switching system to change the power level of the transmitter. Jack Curtis K6KU designed the clock and microprocessor which control the switching circuitry and generate the code identification. Jack has had considerable experience in this field; he's the Curtis of the Curtis keyer and code-teacher line! And finally Cam Pierce K6RU assembled much

of the actual hardware and prepared the actual beacon packages. NCDXF President Jack Troster W6ISQ provided (and is continuing to provide) overall coordination and international supervision of the network.

And continuing on duty on a daily basis is Al Lotze W6RQ, who coordinates the regular observers of the beacons and compiles the reports (see below).

Among the other persons vital to the success of the beacon network are the individual beacon "custodians." These are the hams and groups, carefully selected by the NCDXF, to set up and operate the beacons. In many cases the beacons are under the auspices of a university.

The beacons network grew slowly; the first beacon, WB6ZNL, went on the air at the end of 1979. WB6ZNL has changed callsigns a couple of times since then and is now W6WX/B at Stanford University in Palo Alto, California.

That first beacon required more than hardware. The beacon transmits what is technically an unattended A0 emission, which is not permitted under Federal Communications Commission (FCC) amateur rules. So the Foundation had to request a special waiver of the FCC rules to allow the beacon to begin transmitting. The same held true for the Hawaiian beacon, KH6O/B, under the watchful eye of Bob Jones KH6O. Perry Williams W1UED of the American Radio Relay League's Washington DC office was instrumental in obtaining the necessary waivers.

On the other hand, the other beacon located "within" the United States required no such special permission. The 4U1UN beacon sits on UN territory in New York City and thus falls under the rules of the International Telecommunication Union, which permits the beacon.

The situation was even more complicated in Japan. Japanese amateur regulations had neither rules nor standards about beacons. In order to get permission to establish the beacon in Japan, JA hams had to work with the licensing authority to *write entirely new regulations* for beacon standards.

Perseverance prevailed, however, and by early 1983, all eight beacons were on the air. The beacons' record of dependability has been very good. Some of the beacons associated with universities must occasionally shut down to avoid disturbing delicate experiments. But there has been little unscheduled "downtime" on the system. The only recurring problem was a single resistor in the power supply, since replaced. The network's on-time record is a great tribute to the design, engineering, and maintenance of the beacons.

The very dependability of the beacons has led to one slight problem: the clocks of the beacons slowly drift, and the beacons start to overlap. The clocks in the beacons are accurate to about one part in ten million, or about one half second a month. Since the beacons have required no maintenance other than resetting the clocks, their timers have occasionally drifted enough to overlap. So if you want to set your watch by a radio signal, tune to WWV (see this column, April, 1984).

Al Lotze W6RQ coordinates the beacon reports from this modest station.

Using the Beacons

These beacons, both individually and as a network, provide many benefits to the DXer. Besides the obvious use of determining band openings, hams can use this system to check antennas, compare rigs, calibrate their S-meters, and compute antenna patterns. Let's look at some of these possibilities.

Since the beacons put out the same power day after day, you can use the beacon network to monitor the condition of your station. By logging the signal strengths of the different beacons at various times of the day, you can build a reference point for changes in your station. For example, if your coaxial cable begins to deteriorate, you might notice a gradual reduction in the signal strengths of the beacons. Similarly, changes in switches, filters, and rigs can be compared to the references you establish by consistently monitoring these beacons.

Such consistent monitoring is important if you want to eliminate the vagaries of propagation from your considerations. You don't want to rip out a new antenna just because you tested it on the day of a solar flare!

You can also use the beacon network to check the low-angle radiation pattern of your antenna. Since most of the beacons are a goodly distance from your station, most of the radiation you hear from them will arrive at your antenna at the low angle characteristic of DX communications. By swinging your antenna during the long, 9-second dash of each beacon, you can note relative signal strengths from the front and the back of the antenna. You may find the ratio between these figures quite different from that advertised by the antenna manufacturer!

Of even greater interest to the DXer will be the angle of minimal reception on the antenna. Beam or directional antennas *do* increase the signal strength in a given direction, but they also serve an even more valuable service by reducing the signal strengths of stations lying in other directions. The ability to "null out" or nullify an interfering station is at least as important as the increased signal strength given by the directional antenna.

So the DXer wants to know where to point the beam to *minimize* reception of the offending signal. Knowing where the nulls are in your antenna pattern is as important as knowing the front-to-back ratio.

Another immediate benefit of the NCDXF beacon network is its use for S-meter calibration. The power level of each beacon decreases by a factor of 10, or by 10 dB, each 10 seconds. You can calibrate your S-meter by carefully watching the meter during these power changes. Your meter reading should drop by 10 dB (a little less than 2 S-units) each step in power reduction.

If your receiver doesn't track this way, you might want to produce a calibration chart to reflect the *actual* power levels.

And, of course, the beacons tell what is happening with radio propagation *right now*. How many beacons can you hear? How strong are their signals? How do these signal strengths compare to other days when the propagation was good, medium, or fair?

Beacon report coordinator Al Lotze W6RQ feels that the beacons present a more accurate picture of present amateur-radio propagation than do the WWV bulletins or the forecasts by charts or tables in the amateur-radio magazines. "Those charts don't include the A index" (see this column, last month). "Their Maximum Usable Frequency charts only reflect solar flux. But I have found the A index a more telling indicator of present propagation," Al explains.

How can the DXers best use this propagation information? First, beacon receptions might suggest good possibilities for directional CQs. If you *know* the band is open from your location to Eastern Africa (CT3) you might try a CQ directed toward that area. DX stations are much more likely to answer a directional or specific CQ than a more general "CQ DX."

With regular listening, you can learn a great deal about radio propagation from your station to other parts of the world. When does the long or skew path open up to Europe, or to Japan? In which direction does it peak? What are the differences in signal strength as dawn or sunset passes? When is the best time to get up in the middle of the night to work that rare DXpedition?

The avid student of radio propagation can use the beacon network to obtain even more information. What is the relationship between the WWV flux numbers and propagation from your location? Do the signal strengths of the polar and the equatorial paths change at the same time, or in different patterns? The possibilities are endless.

Making Beacon Reports

If you are serious about listening to the beacons, you might want to share your observations and ideas with others of similar persuasion. Beacon report coordinator Al Lotze W6RQ (see photo) collects the reports from regular and irregular reporters from all over the world.

As of last winter, Al had received more than 250 reports from every continent. The reports have ranged from a simple, "I heard your beacon yesterday," to complex and detailed analyses and theories of propagation. The most dedicated are several European scientists. At least one Belgian amateur sends in a full page of comments and ideas every month! Other regular reporters include engineers and shortwave listeners (SWLs). The list of reporters shows that you don't need fancy equipment to monitor the beacon networks; Al has received a report from a Czechoslovakian amateur who used a direct-conversion receiver!

Amateurs and others interested in becoming regular monitors and reporters for the beacon network should contact Al Lotze W6RQ, 46 Cragmont Ave., San Francisco CA 94116-1306. Al prefers the official reporting form but will acknowledge all reports with a beacon network QSL. You don't have to hear all eight beacons to send in a report, but you should listen to the network several times at different hours and note any patterns.

The informal collection of regular beacon watchers spends more time listening than they do transmitting (like any good DXer!) but they do occasionally key up their rigs during the 2-minute "break" at the end of each sequence of bulletins. If you listen closely during this "off" time, you might hear a beacon observer send "All 8 hrd de W6RQ," or a similar message.

Al Lotze W6RQ Report Coordinator

Al Lotze is an excellent man for the job of coordinating these beacon reports. In his 53 years as an amateur, Al (see photo) has amassed 282 countries on CW. His station today is as elaborate as any he has used in more than 50 years, but you may note the absence of such items as an antenna switch, antenna rotor, or amplifier.

Al runs Kenwood barefoot through a Johnson matchbox to a G5RV antenna on the roof of his home, high on a hill above San Francisco. Al claims his DX success comes from his suffix. "There are more stations with the suffix RQ in the DXCC listing than any other suffix," Al notes with a twinkle in his eye. Despite this simple station setup, Al has frequently heard all eight beacons in one cycle, especially around local sunset when the A index is under 10.

A long-time follower of radio propagation, Al monitors WWV propagation bulletins daily. Weather permitting, Al also sets up his telescope every day to chart the size and position of each sunspot. His charts appear in *QRZ DX* every week.

Al maintains lively communications with his far-flung collection of regular beacon reporters. With a working command of French, Spanish, and German, Al attempts to respond to most reporters in their native languages. With daily charts of the sun's surface for years, careful graphing of the WWV propagation information, and more than 50 years of amateur experience, Al holds his own among

Power Level	Message
100 Watts	QST de (callsign)
100 Watts	. __________ (9-second dash)
10 Watts	.. __________ (9-second dash)
1 Watt	... __________ (9-second dash)
0.1 Watt	.... __________ (9-second dash)
100 Watts	SK (callsign)

The entire sequence takes about 58 seconds, at about 20 words per minute.

Table 2. Beacon transmission pattern.

he professional propagation experts with whom he corresponds.

Results of Beacon Network

The information from the beacon watchers continues to pour into Al's mailbox, so it will be years before any statistically valid results come from this network. But Al has noted several trends which became evident very quickly. The first, and perhaps most interesting pattern, is how the low-power signals can be heard clearly. QRP enthusiasts have been saying this for years: you don't need power to make DX contacts. Listen for yourself to hear how often you can hear the 0.1-Watt level of the beacons. Makes one want to ban all amplifiers.

Another interesting conclusion suggested by the beacon network is that the traditional explanation of how radio waves travel more than 2500 miles is wrong. The textbooks claim that signals which travel farther than 2500 miles must bounce back and forth between the Earth's surface and the ionosphere several times: multi-hop propagation. However, much of the signal is lost in each bounce. The mathematics of this theory suggest that the 0.1-Watt beacon would never be heard if the signal were to propagate via multi-hop propagation. So the radio signal must get from there to here in some other way. We may never know exactly how the signal travels, but we do know that the traditional multi-hop theory has holes in it.

Al has also noticed that the A index seems to be closely related to beacon receptions. The only times he has heard all eight beacons at the same time has been when the A index is very low, 10 or less. He notes that traditional propagation forecasting, including the charts and tables in the amateur press, do not include the A index in their calculations. Thus even when the solar flux might be high enough for good radio, the high A index may prevent good propagation.

The Future of the Network

What's ahead for the NCDXF 20-meter-beacon network? The two "off" minutes certainly suggest that at least two more beacons will be forthcoming soon. In the works for this summer is a beacon on the northern coast of South America, in Colombia. Another possibility for a tenth beacon is the southern end of the South American continent, but the real propagation hounds prefer a Western Australia location, VK6.

The beacon network doesn't have to stop growing at ten. Built into the control circuitry is the ability to switch to 20 beacons per ten-minute cycle. One can imagine a few years from now being able to get exact propagation information to 20 different locations around the world in only 10 minutes!

These beacons and many other DX activities, including major DXpeditions, are sponsored by the Northern California DX Foundation. Membership in the NCDXF is $10.00 and includes a handsome membership certificate. Contact NCDXF at PO Box 2368, Stanford CA 94305.

And please, for the sake of all of those hams listening to the beacons, stay off 14100 kHz!

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

ELMER OF THE YEAR

F. Wendell Tietsworth W2SUE was chosen as QCWA's Northern New Jersey Chapter's 1983 Elmer of the Year from a field of nominees by a committee which included such prominent local amateurs as Joseph Paintsr W2BHM, head of the W2 QSL Bureau, and William Mumford W2CU.

W2SUE has been teaching ham-radio courses since 1985. He currently teaches Novice classes at the Nutley NJ Red Cross Building and is active in Army Mars as AAR2JP.

SOUTH EAST QUEENSLAND TELETYPE GROUP AWARD

This award is open to all transmitting and listening amateurs who gain award points in the following manner: Australian amateurs must score 5 points and overseas amateurs must score 3 points.

(a) To qualify, a station must, where possible, copy the official station of the South East Queensland Teletype Group, VK4TTY, during a news broadcast and, in the case of a transmitting amateur, participate in the callback (2 award points). A portion of the printout of the news broadcast together with the date, time, frequency, and broadcast number are to accompany the request for the award.

(b) Additionally, a transmitting amateur must work three member stations of the SEQTQ on RTTY (1 point each). Log extracts and/or printouts are to be included with the award application, and each member station may be counted only once towards the award.

(c) Listening amateurs should, in lieu of (b), forward log extracts and/or printouts of three contacts involving different member stations of the SEQTG (1 point each).

Applicants for the award should forward the above information together with one dollar Australian or 5 IRCs, to cover postage and printing costs, to the Secretary, SEQTG, PO Box 274, Sunnybank, Queensland 4109, Australia.

WORKED ALL BERMUDA

The WAB Award is issued to amateurs throughout the world by the Radio Society of Bermuda. To qualify, applicants must submit proof of having worked a minimum of nine (9) parishes in Bermuda: Sandys, Southampton, Warwick, Paget, Pembroke, Devonshire, Smith's, Hamilton, and St. George's.

The award is an antique map of Bermuda (20" × 23") suitably inscribed with the recipient's name and callsign and signed by His Excellency the Governor of Bermuda.

The award is not available to stations who worked Bermuda via mobile including maritime or aeronautical. No band or mode endorsements are available. Only one mobile or portable from within Bermuda may be used in making claimed contacts on your applications.

QSL cards are required as proof of contact and they must be sent to the awards manager with sufficient postage for their safe return. The Bermuda Award is issued free of charge! Submit your applications to: Award Manager, PO Box 275, Hamilton 5, Bermuda.

WORKED BROWARD COUNTY CITIES

The Broward Amateur Radio Club, Inc., sponsors the new WBCC award, available to licensed amateurs who submit proof of two-way contact as follows:

(a) Residents of Broward, Colliers, Dade, Glades, Hendry, Lee, Martin, Monroe, or Palm Beach counties must work all 29 of the cities listed below.

(b) All other amateurs must work 15 of the 29 cities within Broward county.

To be valid, all contacts must be verified by at least two fellow amateurs and application must show all logbook information as well as the OTH of the station worked.

To apply, mail your application with $1.00 (US funds) and two first-class stamps (DX stations send 10 IRCs) to: BARC Award Manager, WD4RAF, 1921 NW 41st Street, Oakland Park FL 33309.

Qualifying city contacts include: Coconut Creek, Cooper City, Coral Springs, Dania, Davie, Deerfield Beach, Fort Lauderdale, Hacienda Village, Hallandale, Hillsboro Beach, Hollywood, Lauderdale-by-the-Sea, Lauderdale Lakes, Lauderhill, Lazy Lake, Lighthouse Point, Margate, Miramar, North Lauderdale, Oakland Park, Parkland, Pembroke Park, Pembroke Pines, Plantation, Pompano Beach, Sea Ranch Lakes, Sunrise, Tamarac, and Wilton Manors.

WORKED ALL ASIAN AWARD

The WAAA program requires the applicant to work other amateurs in the member countries of the Association of Southeast Asian Nations. Work 5 Philippine contacts, 1 Malaysian contact, 2 Indonesian contacts, 1 in Thailand, and 1 station in Singapore. Special endorsements will be given for All-Phone, All-CW, Single-Band, and Five-Band contacts.

Have your list of contacts verified by at least two radio-club officials and be sure all contacts were made after January 1, 1970, to be valid. Forward appropriate logbook information in your application along with $4.00 (US funds only, no IRCs) to the Award Manager: Edwin Zambrano DU1EFZ, PO Box AC-166, Quezon City 3001, Philippines.

WORKED ALL DU AWARD

This award is available to all licensed amateurs who can show proof of having contacted at least one station from each of the call areas in the Republic of the Philippines (DU1 to DU9, except DU5).

Contacts may be made on any band or mode and special endorsements will be issued upon request for All-Phone, All-CW, Single-Band, or Five-Band accomplishments.

Contacts for the DU Award must be made on or after January 1, 1970. To apply, forward a list of contacts which have been verified by two officers of a radio organization. Your application must show all logbook information for each contact. Send the list and $4.00 (US funds only—no IRCs, please!) to: Edwin Zambrano DU1EFZ, PO Box AC-166, Quezon City 3001, Philippines.

VK1 ACHIEVEMENT AWARD

The A.C.T. Division of the Wireless Institute of Australia is proud to announce the creation of its newest award, the VK1 Achievement Award. This award has the aim of increasing interest in the VK1 prefix and in promoting Canberra and Australia internationally.

As there are only 300 VK1 licensees, the award will not be an easy one to achieve, particularly on some bands and modes. The VK1 Award is available to licensed amateurs throughout the world. To qualify, stations within Australia must work 20 stations in VK1 land on HF and on VHF. Stations outside Australia must work a minimum of 10 VK1 stations for the HF segment of the award.

To apply, submit your list of contacts, including the GMT time and date worked, the band and mode of operation, and any reports or ciphers exchanged. To be valid, all contacts must be made on or after January 1, 1978. Endorsements may be given at the time application is made. Five IRCs or $2.00 in Australian currency cover the cost of the award and should be sent to the Award Manager, c/o WIA, PO Box 46, Canberra A.C.T. 2600, Australia.

By the way, the VK1 Award is also made available to shortwave listening stations on a heard basis. QSL confirmation is required.

WORKED ALL FORGOTTONIA

Announcing the awards program sponsored by LEARC, the Lamoine Emergency Amateur Radio Club of Macomb, Illinois. The Worked Forgottonia Award is issued to amateurs who confirm contact with three (3) licensed amateurs of Forgottonia. The Worked All Forgottonia Award is issued to operators confirming contact with at least one amateur in each of the sixteen counties of Forgottonia

What is Forgottonia? It is the 51st state! It consists of the following counties (formerly west central Illinois): Adams, Brown, Calhoun, Cass, Fulton, Greene, Hancock, Henderson, Knox, McDonough, Mercer, Morgan, Pike, Schuyler, Scott, and Warren.

All contacts must be made after June 28, 1980, to be valid From the letter we received from the club, the award evidently is issued at no charge since no remittance was mentioned. Forward your list of verified contacts and a 9" × 12" SASE to the attention of AG9Y, c/o LEARC, 1224 Maple Avenue, Macomb IL 61455.

WAT AWARD

The Cabin Fever Radio Club of Tok, Alaska, offers a certificate for contacting three amateurs in Tok. There are no band or mode restrictions. However, all contacts must be made after December 15, 1980, to be considered valid.

To apply, prepare a list of contacts in order by callsign. Include the name of the station operator, the date and time worked in GMT, and the mode and band of operation. QSLs not required. Amateurs located in Tok include AL7O, AL7BO, AL7BV, and WL7APG.

Send your application with $2.00 or 10 IRCs to: Cabin Fever Radio Club, Box 451, Tok AK 99780.

BASEBALL SPECIAL

The Lewis-Clark ARC will operate W7VJD Friday, June 1, from 0200Z until the last game has been played, Saturday, June 2, from 1600Z until last game played, and Sunday, June 3, from 1600Z until last

game played, during the NAIA World's Collegiate Baseball Tournament, on the campus of Lewis-Clark State College.

Frequencies: 14.270, 7.235, 3.940 ± QRM phone; 14.130, 7.125 ± QRM CW.

Please send SASE for QSL via Dan Wenstrom WB7BQV, 630 Stewart, Lewiston ID 83501.

EIGHTH STREET FESTIVAL

The Madison County Amateur Radio Club will operate the club station, W9VCF, portable from the historic Eighth Street Festival in Anderson, Indiana, on June 8 and 9, 1984. A special certificate will be offered to persons contacting the club station during the festival or any club member during the month of June. Suggested operating frequencies are: 28.785, 21.400, 14.340, 7.290, and 3.990 MHz.

Send log information and a dollar donation to: Madison County ARC, c/o Frank M. Dick WA9JWL, 921 Isabella Drive, Anderson IN 46013.

SPECIAL-EVENTS STATION 7SK0AC

The Swedish Telecommunications Administration has given permission to the Swedish Radio Amateur Radio Club to use the special-events prefix 7SK in connection with operations from the club station, SK0AC, during the annual conference of the European DX Council in Stockholm, June 8-10, 1984. The EDXC is the umbrella organization of the shortwave radio listening clubs in Europe. The annual conference has become *the* meeting place in Europe for international broadcasters who are actively involved in programming or the technical side of international radio and the representatives of the listeners' clubs, which can now boast more than thirty thousand members.

The 1984 conference is being hosted by Radio Sweden International and the Swedish DX Federation at the studios of RSI in Stockholm. 7SK9AC will be on the air during the conference, operated by members of the club and licensed amateurs among the conference participants. Among those who are expected to operate from the station are Victor Goonetilleke 4S7VK, Colin Richards 9M2FJO, Lars Rooth HV3SJ, Wolf Harranth OE1WHC, and Bernt Erfjord LA5TBA.

7SK0AC is expected to go on the air at about 1500 hours GMT on Friday, June 8, 1984. Operation will continue at various times during the conference on Saturday, June 9, and Sunday, June 10. Frequencies to be used during daylight hours are 14060 kHz (CW), 14320 kHz (SSB), 21060 kHz (CW), and 21350 kHz (SSB); and during hours of darkness, 3550 kHz (CW) and 3700 kHz (SSB).

There will also be some operation on the 2-meter band.

MECA

The Macomb Emergency Communications Association will have its second special event on the weekend of June 8-10. Operation will commence at 2200Z Friday, June 8, and continue around the clock to 2200Z Sunday, June 10, near the lower end of the General-class portion of each amateur band as propagation dictates. Modes of operation will be SSB and CW/RTTY on HF and FM phone on 146.07/.67. QSL to MECA, Box 488, Utica MI 48087 with a 9" × 12" SASE for certificate. DX stations need send only QSL

BROOKFIELD ZOO

The Chicago Suburban Radio Association will operate special-event radio station N9BAT from the Brookfield Zoo in celebration of its 50th anniversary. It is one of the largest zoos in the United States and was the first American zoo to exhibit animals in naturalistic displays behind moats instead of in cages. Its Tropic World is the largest zoo building in the world, housing African, Asian, and South American rain forests.

Operation will be June 9 and 10 from 1600Z-2400Z, using the phone frequencies of 7.250 and 14.250 MHz. A special full-color zoo QSL card will be available to all stations that reply with their QSL card and a #10 (business-size) SASE to: N9BAT Special Event, PO Box 383, Brookfield IL 60513.

KNOX COUNTY ARC

The Knox County Amateur Radio Club will have a special-event station on the air to commemorate Galesburg Railroad Days. Railroad Days is an annual event for Galesburg, Illinois, which pays tribute to the role of the Burlington Northern (formerly the CB & Q) and the Sante Fe Railroads in the development of the area.

The KCARC will have its special-event station on the air on Saturday and Sunday, June 9 and 10, 1984, from 1300Z 'til 2200Z. The station will operate on one of the following frequencies: 7.235, 14.280, 21.375, and 28.630 MHz, plus or minus QRM and depending on band conditions. The call of the station will be W9GFD. A special commemorative QSL card will be sent to any station contacted which sends an SASE to the Knox County ARC, Inc., W9GFD, 1894 Bluebird Drive, Galesburg IL 61401.

HELEN KELLER DAYS

The Muscle Shoals ARC will operate W4JNB from 1600-2100Z on June 29 and 30 and July 1, 1984, from Spring Park, Tuscumbia, Alabama, in celebration of Helen Keller Festival Days. Phone frequencies are 7270-7290 and 14,280-14.295. For an 8" × 10" certificate, send an SASE (4" × 10" envelope) to Box 2745, Muscle Shoals AL 35862. Talk-in on two meters, 146.01/.61.

TOM SAWYER DAYS

The Hannibal Amateur Radio Club, Inc., will issue a fourth annual special certificate from the National Tom Sawyer Days celebration in Mark Twain's boyhood home town, Hannibal, Missouri, on Saturday, June 30 and Sunday, July 1, 1984. Hours: 1500-2100 UTC both days. Frequencies: phone 7.245, 14.290, 21.400, 28.770; and CW 7.125 and 21.125 MHz. Help us celebrate!

To receive the certificate, send a large (8 × 10) SASE and your personal QSL card confirming the contact to Hannibal Amateur Radio Club, Inc., W0KEM, 2108 Orchard Avenue, Hannibal MO 63401.

For further information, call Tony McUmber, 2108 Orchard Avenue, Hannibal MO 63401; (314)-221-6199.

ANNIE OAKLEY DAYS

W8UMD, the Treaty City ARA, will operate the Annie Oakley special-event station from 1400Z July 28 to 0200Z July 29, and 1400Z to 2200Z July 29. Frequencies will be 3910 kHz, 7235 kHz, and 14285 kHz. Send 9" × 12" SASE for unfolded certificate; otherwise send #10 SASE to TCARA, PO Box 91, Greenville OH 45331.

LETTERS

YES, IT WAS

Was that the same Ishmod Kaduk, the great explorer, who found the extension of Lake Michigan into Montana?

Roger Coppock
Bradview IL

OH YES HE WAS

Ishmod may not have been a fool, but I read up to p. 224 before I realized it was April!

Harry Church W0KXP
Lebanon IL

ISHMOD FOOLED AGAIN

The article on Ishmod's Journal (*73*, April, 1984) is one of the finest exposés on the potential perils of the DXpedition ever written. Reading it positively started my heart pounding with the desire to go rent an old Argentine aircraft carrier, hire a crew of Lascars and Dacoits, and get out among 'em. There is, however, a problem with the map you printed and the geography of the DXpedition in general. Some of my irregular friends will claim that the map you printed was originally made near Agra by Jonathan Small, Abdullah Khan, Mahomet Sing, and Dost Akbar, in the late 1870s. Others will attribute the map to a certain seagoing Bellman of the same period, citing these lines (see box).

Unfortunately, the map is a red herring. The true location of the island Ishmod and his friends found is, I am afraid, more sinister. The island where Ishmod and his friends landed can be none other than the dread R'lyeh which rises occasionally from the dark waters of the South Pacific and Indian Oceans. This island was first documented in English by H. P. Lovecraft, in 1928. It also is mentioned by the 15th century Arab scholar, Abdul Alhazred in his *Nacronomicon*. (Copies of the *Necronomicon* can be found in the Widener Library at Harvard and in the library crypt at Miskatonic University in Arkham, Massachusetts.) As further evidence, note the parallels between the log of the Brig *Emma* cited by Lovecraft and Ishmod's last printed words. Ishmod speaks of phenomena which defied the laws of physics. In the *Emma* log, we hear Johansen speak of geometry which was "abnormal, non-Euclidean, and loathsomely redolent of spheres and dimensions apart from ours." The partially complete reference to the rocks of the island also correlates with the Lovecraft account of unbelievable greenish stone blocks at R'lyeh.

From the above discussion, I think it clear that Ishmod and his friends have fallen prey to Cthulhu or some other of the star-born Old Ones. Only the other day on one of the Pacific DX nets I heard at about 35 wpm the horrid refrain, "Ph'nglui mglw'nafh Cthulhu R'lyeh wgah'nagl fhtagn." I fear for my fellow hams on other Pacific and Indian Ocean DXpeditions. They should take great care.

Henry P. Dowst KA6KNJ
Pacific Palisades CA

THANKS, 73

Just a short note to thank you for *73*. I have been a ham for only one year and have found *73* to be excellent reading with enough "beginner" projects to keep my interest high and my curiosity aroused.

I am not very adept at the technical aspects of amateur radio yet, but the projects in *73* are educating me and encouraging me to learn by doing.

Also, I think your editorials are terrific. It's been a long time since I've enjoyed reading someone's philosophy who has the courage to tell people the real facts of life; that is, "If you want something, go after it and earn it!" Thanks for reaffirming my belief in the spirit that once made this country great. I hope more people begin to re-apply this attitude.

Keep up the good work!

Gary Mills KB4ENG
Middlesboro KY

WET BATTERIES

Reference is made to your article, "Wet Battery Quiz."

First of all, smartass that I am, I'll admit I flunked the quiz. And I thought I knew it all, like the subtitle said.

I think I can clear up your author's comprehension on a couple of related points. He asks, "How could the concrete floor get through the acid-impervious case?" The time-honored advice to not so store a lead/acid battery is correct. Such storage frequently implies storage in an unheated garage or outbuilding. At night the temperature of the battery and floor both drop. In the morning, with the battery in intimate contact with the floor as a heat sink, warm moist air will cause condensation on the exterior case.

He is correct in stating that the acid path across the top of the battery will cause leakage.

He asks, "How come the acid inside the case does not cause current leakage?" Fair question. Here is my answer: First of all, think of a 2-volt cell as two "half-cells" with the gross part of the acid between them as a conductor and the acid in intimate contact with each cathode or anode as highly ionized and a component of the half-cell. With this concept it can be realized that an acid path across external terminals of greater potential than 2 volts will indeed cause a current to flow. And to make the case crystal clear to anyone still doubting, the highly-ionized interface between the conducting acid and the terminal "plates" out as a different colored chemical depending on the terminal polarity. White negative, and green positive.

I hope this clears up his understanding; it has mine. Thanks for a great article. I am an Old Car Nut, and between winter storage and summer heat and overcharging of these animals, what I have learned will be put to good use immediately.

William T. Tyrrel W2YKG
East Northport NY

SUPPORT YOUR NET

This is the first letter that I have written to you for publishing and I suppose that not all amateurs will agree, but I do know that the message needs to be gotten across. I suppose that the best title for this would be "An Open Letter to All Amateurs." I am not the best at spelling nor am I convinced that this will even be published, but I thought that I would at least make an attempt.

I have been a ham for around 8 years now and, like many hams, spend very little time on the air. An incident happened to me, though, that inspired me to write this letter. I had a QSO with a Mexican amateur station, and by coincidence he had a very good friend in a small town in Tennessee whom he had not been able to contact. Having checked into the Tennessee Net several times, I knew that I had a chance to contact his friend, so I offered to pass a message and see if I could arrange to get the two together on a 15- or 20-meter frequency. My Mexican amateur was very excited about this, although he didn't understand the net type of operation or its purpose. On March 8th, 1984, it just so happened that there was another ham in that *small* community in Tennessee who also was on the same phone exchange. Not only was I able to get the message across to my Mexican's friend, but also he was going to meet him on the air at the same time that I had arranged a schedule with him the following Saturday.

The moral of this story is, *please*, no matter how large a community you belong to, *support your local state net*! I had no idea that there was even another ham in that community, other than the one I needed to contact, but there was, and because he devoted thirty minutes of his time to be on the net, I was able to get two good friends together and back on track. Whether it is across the state, country, or world, the nets serve a very important purpose but are useless unless they have the support of the hams in the state and communities and counties of the state. It may be that you may never be called upon for traffic to your area, but what a blessing it is when you need an area and you can immediately get that area and pass the message.

I have heard many negative comments about the nets, how trivial they are, and that they serve no purpose, but believe me, one such use as I had and the net takes on a whole new meaning. I hate to hear the negative comments on how bad nets are conducted. It may be that a certain net control is bad or a certain net is inconsistent, but as amateurs we all owe it to ourselves to make an effort to learn proper net procedures—both CW and SSB. Some time, devote one night of the week to your state's net and get to know the net controls and the purpose of the nets, the time they meet, and most of all how you can contribute. I would like personally to charge all amateurs to help promote the best public service that we, as amateurs, can provide, and *get involved*. If you don't because of the lack of net procedures, write the editors of this publication or any ARRL official and I know that they will be glad to assist you. The message needs to get out, and an amateur's time cannot be put to better use than trying to help his fellow amateurs and the public by net participation.

Gary B. Kendrick KW4Z
Chattanooga TN

TWO-METER BEACON

The Lincoln Communications Society, Lincoln, Nebraska, has constructed a beacon transmitter to provide a signal for propagation studies and frequency reference. The beacon currently operates A1 (CW) on 144.055 MHz with an output power of 10 Watts to an omnidirectional antenna. The beacon location is in the northeast corner of grid square EN-10. The ID callsign is WB0QIY/B. Reception reports should be sent to me at the Lincoln Communications Society.

Charles Connor K0NG
Secretary
1801 So. 48th St.
Lincoln NE 68506

FAR OUT, FAROUT ARC!

On September 17, 1983, I worked Ruthann WD8BMK, who was operating special-event station WB8SMC in celebration of the 10th Anniversary of the Farout Amateur Radio Club located in Dayton, Ohio.

We exchanged the QSLs and on March 3, 1984, I received a beautiful personalized plaque as a token of the club's thanks for being a part of their celebration. Three QSLs had been drawn at random, and I was lucky to be one of them.

I would like to publicly thank the Farout Amateur Radio Club very much. A club like this that takes that extra step has to go *far*!! May they have 100 more anniversaries!

Richard C. Schott KA2PHQ
Spencerport NY

DX WORLD

Recently a program I wrote appeared in *73* (February, 1984), "Put the DX World On the Screen." I would like to thank all the many people that wrote me with their comments, suggestions, and their orders. The real pay in doing a project like this is the thanks that I receive from all my fellow hams; Lord knows the money isn't worth it. I hope that all the people who received my program were pleased with what they received.

As many people already know, I did a rewrite of the Prefix Locator program for the

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He had brought a large map representing the sea,
Without the least vestige of land:
And the crew were much pleased when they found it to be
A map they could all understand.

"What's the good of Mercator's North Poles and Equators,
Tropics, Zones, and Meridian Lines?"
So the Bellman would cry: and the crew would reply
"They are merely conventional signs!"

"Other maps are such shapes with their islands and capes!
But we've got our brave Captain to thank"
(So the crew would protest) "that he brought us the best—
A perfect and absolute blank!"

From "A Nautical Ballad," Charles Carryl, 1841-1920.

FCC

Reprinted from the Federal Register

Reimbursement of Out-of-Pocket Costs for Volunteer Administered Amateur Radio Examinations

AGENCY: Federal Communications Commission.

ACTION: Proposed rule.

SUMMARY: This document proposes to amend the rules to provide for reimbursement of out-of-pocket costs incurred by volunteer examiners and volunteer examiner coordinators in connection with amateur operator license examinations. Cost reimbursement is necessary for the volunteers in order for them to recover their prudently-incurred expenditures. The effect of this action is to propose rules allowing cost reimbursement.

DATES: Comments are due by April 16, 1984 and replies by May 1, 1984.

ADDRESS: Federal Communications Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT: Maurice J. DePont, Private Radio Bureau, Washington, D.C. 20554.

List of Subjects in 47 CFR Part 97

Radio.

Notice of Proposed Rule Making

In the matter of reimbursement of out-of-pocket costs for volunteer administered amateur radio examinations; PR Docket No. 84-265, FCC 84-75.

Adopted: March 6, 1984.
Released: March 9, 1984.
By the Commission.

1. Notice of Proposed Rule Making in the above-captioned matter is hereby given.

2. The Federal Communications Commission Authorization Act of 1983 (Pub. L. 98-214; approved December 8, 1983) amended Section (4)(f)(4) of the Communications Act,[1] to provide for the reimbursement of out-of-pocket costs incurred by volunteer examiners and volunteer examiner coordinators in connection with the preparation, processing or administration of examinations for amateur station operator license. The American Radio Relay League, Inc. (ARRL) filed a Request for Agency Action on December 7, 1983, requesting that the Commission implement the legislation by amending the rules by Order as soon as possible. However, since this matter affects a large number of people (amateur licensees and applicants), we are providing for notice and comment.

3. Our proposed rules would allow both the volunteer examiner (VE) and the volunteer examiner coordinator (VEC) to be reimbursed. Each amateur radio examination, except the Novice Class,[2] is to be administered by three VE's. They may be reimbursed for the expenses they incur in administering the examination. Likewise, the VEC may be reimbursed for its preparation and processing of the examination. The total reimbursement from each examinee, however, may not exceed $4 for an examination. It could be less than that amount, depending upon the circumstances.

4. We do not propose to specify how the reimbursement fee is to be divided among the VEC's and the VE's. Both the VE's and VEC's may incur expenses. VEC's may be reimbursed for expenses that they incur in preparing and processing examinations. This could include the costs of printing, assembling and distributing the exams. In addition, a VEC may have other administrative costs since the VEC is responsible for keeping records on each examination that is given. Postage is another anticipated expense since the VEC must forward the applications of successful applicants to the Commission. There may also be costs for renting the premises where an exam is given. A VE, on the other hand, may have costs for transportation to the site of an exam and perhaps lodging expenses. Also, VE's will have postage expenses since they must forward the applications of successful applicants to the VEC. VE's may also have expenses for paper, pencils and supplies that are furnished to the applicants. We cannot anticipate every expense that a VEC or VE may incur. The statute provides that expenses may be reimbursed only if they are necessarily and prudently incurred by uncompensated volunteers. Proposed rule § 97.36 is intended to be flexible. It states that the VEC and the VE both may be reimbursed. However, they may determine how much of the reimbursement amount each will receive.

5. Present §§ 97.31 and 97.507 which relate to the VE and the VEC, respectively, provide that no compensation from any source may be accepted. We propose to amend those sections to allow for reimbursement of necessary and prudent expenses.

6. It would seem that in most cases the VE could most conveniently collect the reimbursement fee since the VE and the examinee directly interact. Candidates initially submit their applications directly to the VE's. However, in certain cases, a VEC may devise a program where the reimbursement is collected by it and then shared with the VE's to defray their out-of-pocket expenses. Varying conditions and practical necessities may affect who collects the money initially. Accordingly, we do propose to allow either the VE or the VEC to collect the fee. In the interest of flexibility, we will leave that to the VEC's and the VE's to determine.

7. The amount of reimbursement from each examinee, which may be less than the statutory $4 but may not exceed that amount, will be a reimbursement amount that is associated with *one* application. One application may result in a telegraphy exam and one or more written exam elements. All those tests will be covered under one reimbursement amount. However, once the application is acted upon by grant or by dismissal, the reimbursement amount is final. If an examinee fails an examination and later submits a new application, a new reimbursement amount may be collected.

8. As authorized by the legislation, we propose to allow the amount of reimbursement to be adjusted for inflation every January 1 as reflected in the Department of Labor Consumer Price Index. The new maximum would be stated annually in a public notice.

9. If fees are charged, both the VE and the VEC would be required to maintain records of out-of-pocket expenditures and certify annually to the Commission that all costs for which they obtained reimbursement were necessarily and prudently incurred. We would cancel the agreement that we have with a VEC if the VEC recovered more than out-of-pocket costs. Such cancellation is provided for in § 97.511 of our present rules. Section 97.33 provides that a VE will be subject to appropriate sanctions for recovery of any amount in excess of that permitted.

10. We believe that reimbursement for expenditures will make the program more attractive to volunteers and more effective. We will continue to administer some examinations in our field offices and at a few remote points in 1984 until such time as the volunteer program is in place. However, our resources for this work are very limited. We wish to implement the volunteer examination program as soon as possible for the good of the amateur community. Therefore, the comment period will be 30 days, with reply comments due 15 days thereafter. Requests to extend the time for filing comments or reply comments are discouraged and will not be routinely granted.

11. For purposes of this non-restricted notice and comment rule making proceeding, members of the public are advised the *ex parte* contact are permitted from the time the Commission adopts a Notice of Proposed Rule Making until the time a public notice is issued stating that a substantive disposition of the matter is to be considered at a forthcoming meeting or

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[1] Section 4(f)(4) was amended by adding subparagraph (J) as follows:

"(J) With respect to the acceptance of voluntary uncompensated services for the preparation, processing or administration of examinations for amateur station operator licenses pursuant to subparagraph (A) or (B) of this paragraph, individuals, or organizations which provide or coordinate such authorized volunteer services may recover from examinees reimbursement for out-of-pocket costs. The total amount of allowable cost reimbursement per examinee shall not exceed $4, adjusted annually every January 1 for changes in the Department of Labor Consumer Price Index. Such individuals and organizations shall maintain records of out-of-pocket expenditures and shall certify annually to the Commission that all costs for which reimbursement was obtained were necessarily and prudently incurred."

[2] None of the proposed rules applies to the examination for the Novice Class license. Senator Goldwater, the sponsor of the legislation, stated, "[t]he legislation I am introducing today is not intended to have any effect upon the present novice program * * *". *Congressional Record-Senate*, S 15376; November 3, 1983.

until a Final Order disposing of the matter is adopted by the Commission, whichever is earlier. In general, an *ex parte* presentation is any written or oral communication (other than formal written comments/pleadings and formal oral arguments) between a person outside the Commission and a Commissioner or a member of the Commission's staff which addresses the merits of the proceeding. Any person who submits a written *ex parte* presentation must serve a copy of that presentation on the Commission's Secretary for inclusion in the public file. Any person who makes an oral *ex parte* presentation addressing matters not fully covered in any previously-filed written comments for the proceeding must prepare a written summary of the presentation; on the day of the oral presentation, that written summary must be served on the Commission's Secretary for inclusion in the public file, with a copy to the Commission official receiving the oral presentation. Each *ex parte* presentation must also state by docket number the proceeding to which it relates. See generally, Section 1.1231 of the Commission's Rules, 47 CFR 1.1231. A summary of the Commission's procedures governing *ex parte* contacts in informal rule makings is available from the Commission's Consumer Assistance Office, FCC, Washington, DC 20554, (202) 632-7000.

12. Authority for issuance of the Notice is contained in Sections 4(i) and 303(r) of the Communications Act of 1934, as amended, 47 U.S.C. 154(i) and 303(r). Pursuant to applicable procedures set forth in § 1.415, 47 CFR 1.415, of the Commission's Rules, interested persons may file comments on or before April 16, 1984 and reply comments on or before May 1, 1984. All relevant and timely comments will be considered by the Commission before final action is taken in this proceeding. In reaching its decision, the Commission may take into consideration information and ideas not contained in the comments, provided that such information or a writing indicating the nature and source of such information is placed in the public file, and provided that the fact of the Commission's reliance on such information is noted in the Report and Order.

13. In accordance with § 1.419 of the Commission's Rules, 47 CFR 1.419, formal participants must file an original and five copies of their comments and other materials. Participants who wish each Commissioner to have a personal copy of their comments should file an original and eleven copies. Members of the general public who wish to express their interest by participating informally may do so by submitting one copy. All comments are given the same consideration, regardless of the number of copies submitted. Each set of comments must state on its face the proceeding to which it relates (PR Docket Number) and should be submitted to: The Secretary, Federal Communications Commission, Washington, D.C. 20554. All documents will be available for public inspection during regular business hours in the Commission's Public Reference Room at its headquarters in Washington, D.C.

14. In accordance with Section 605 of the Regulatory Flexibility Act of 1980 (5 U.S.C. 605), the Commission certifies that these rules would not, if promulgated, have a significant economic impact on a substantial number of small entities, because these entities may not use the Amateur Radio Service for commercial radio communication (see 47 CFR 97.3 (b)) and because these rules would have no foreseeable impact on manufacturers of Amateur Radio Service equipment.

15. The request for agency action filed by the ARRL is granted to the extent that it requests rules to implement the legislation which permit reimbursements of volunteers who administer or coordinate Amateur Radio examinations and is denied insofar as it requests that such rules be adopted without notice and opportunity for public comment.

16. It is ordered, That the Secretary shall cause a copy of this Notice to be served upon the Chief Counsel for Advocacy of the Small Business Administration and that the Secretary shall also cause a copy of this Notice to be published in the Federal Register.

17. For information concerning this proceeding, contact Maurice J. DePont, Federal Communication Commission, Private Radio Bureau, Washington, D.C. 20554, (202) 632-4964.

Federal Communication Commission.
William J. Tricarico,
Secretary.

Appendix

PART 97—[AMENDED]

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

1. Section 97.31(c) is revised to read, as follows:

§ 97.31 Volunteer examiner requirements.

* * * * *

(c) Volunteer examiners may not be compensated for services. They may be reimbursed for out-of-pocket expenses, except for Novice class examinations (see § 97.36)

* * * * *

2. Section 97.33 is revised to read, as follows:

§ 97.33 Volunteer examiner conduct.

No volunteer examiner shall give or certify any examination by fraudulent means or for monetary or other consideration. Violation of this provision may result in the revocation of the amateur radio station license and the suspension of the amateur radio operator license of the volunteer examiner. This does not preclude a volunteer examiner from accepting reimbursement for out-of-pocket expenses under § 97.36. Recovery of any amount in excess of that permitted may result in the sanctions specified herein.

3. New section 97.36 is added, as follows:

§ 97.36 Reimbursement for expenses.

(a) Each volunteer-examiner coordinator and each volunteer examiner may be reimbursed by examinees for out-of-pocket expenses incurred in preparihg, processing or administering examinations for amateur station operator licenses above the Novice Class. The volunteer-examiner coordinator or the volunteer examiner must collect the reimbursement, if any, from the examinees. No reimbursement may be accepted for preparing, processing or administering Novice class examinations.

(b) The maximum amount of reimbursement is $4.00 and will be adjusted annually each January 1 for changes in the Department of Labor Consumer Price Index and announced by the Commission in a Public Notice. The amount of such reimbursement from any examinee for any examination or series of examinations related to a single application must not exceed the published maximum.

(c) A volunteer-examiner coordinator or volunteer examiner who accepts reimbursement must maintain records of the out-of-pocket expenses and reimbursements and must certify annually to the Commission's office in Gettysburg, PA 17325 that all expenses for which reimbursement was obtained were necessarily and prudently incurred.

4. Section 97.507(e) is revised to read, as follows:

§ 97.507 VEC qualifications.

* * * * *

(e) Agree not to accept any compensation from any source for its services as a VEC, except reimbursement for out-of-pocket expenses permitted by § 97.36; and

* * * * *

SATELLITES

Amateur Satellite Reference Orbits

	OSCAR 8		RS-5		RS-6		RS-7		RS-8		
Date	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	Date
Jun 1	0052	110	0023	106	0153	135	0120	122	0010	98	1
2	0056	111	0018	106	0138	133	0111	121	0007	99	2
3	0100	112	0012	106	0122	130	0101	120	0004	100	3
4	0105	113	0007	107	0107	128	0051	119	0002	101	4
5	0109	115	0002	107	0051	126	0042	118	0159	131	5
6	0113	116	0156	137	0036	123	0032	117	0156	132	6
7	0118	117	0151	137	0021	121	0022	116	0153	133	7
8	0122	118	0145	137	0005	119	0013	115	0150	134	8
9	0126	119	0140	138	0149	146	0003	115	0147	135	9
10	0131	120	0134	138	0133	144	0152	144	0144	135	10
11	0135	121	0129	138	0118	142	0143	143	0142	136	11
12	0139	122	0124	138	0102	139	0133	142	0139	137	12
13	0001	98	0118	138	0047	137	0124	141	0136	138	13
14	0005	99	0113	139	0032	135	0114	140	0133	139	14
15	0009	100	0108	139	0016	132	0104	139	0130	140	15
16	0014	101	0102	139	0001	130	0055	138	0127	140	16
17	0018	102	0057	139	0144	157	0045	137	0125	141	17
18	0022	103	0052	139	0129	155	0035	136	0122	142	18
19	0027	104	0046	139	0113	153	0026	136	0119	143	19
20	0031	105	0041	140	0058	150	0016	135	0116	144	20
21	0035	107	0036	140	0042	148	0006	134	0113	144	21
22	0040	108	0030	140	0027	146	0156	163	0110	145	22
23	0044	109	0025	140	0012	143	0146	162	0108	146	23
24	0048	110	0020	140	0155	171	0136	161	0105	147	24
25	0053	111	0014	141	0139	169	0127	160	0102	148	25
26	0057	112	0009	141	0124	166	0117	159	0059	149	26
27	0101	113	0004	141	0109	164	0108	158	0056	149	27
28	0106	114	0158	171	0053	162	0058	157	0053	150	28
29	0110	116	0153	171	0038	159	0048	157	0051	151	29
30	0114	117	0147	172	0022	157	0039	156	0048	152	30
Jul 1	0119	118	0142	172	0007	155	0029	155	0045	153	1
2	0123	119	0137	172	0150	182	0019	154	0042	153	2
3	0127	120	0131	172	0135	180	0010	153	0039	154	3
4	0132	121	0126	172	0119	177	0000	152	0036	155	4
5	0136	122	0120	173	0104	175	0149	181	0034	156	5
6	0140	123	0115	173	0049	173	0140	180	0031	157	6
7	0002	99	0110	173	0033	170	0130	179	0028	158	7
8	0006	100	0104	173	0018	168	0120	179	0025	158	8
9	0010	101	0059	173	0002	166	0111	178	0022	159	9
10	0015	102	0054	173	0146	193	0101	177	0019	160	10
11	0019	103	0048	174	0130	191	0052	176	0017	161	11
12	0023	104	0043	174	0115	189	0042	175	0014	162	12
13	0028	105	0038	174	0100	186	0032	174	0011	162	13
14	0032	106	0032	174	0044	184	0023	173	0008	163	14
15	0036	108	0027	174	0029	182	0013	172	0005	164	15

HAM HELP

Can anyone please advise me who would have service data on file or for sale on the sets made for the US Government for WWII—Army Signal Corps and US Navy.

F. Krantz
100 Osage Ave.
Somerdale NJ 08083

Needed: Model 14-X dc module for Swan 350.

Kurt R. Fritsch WA3TOY
7882-103 Americana Circle
Glen Burnie MD 21061
(301)-766-7903

Need lots of help on how to FM the receive on the Drake TR-3 or TR-4, information and schematics, if possible.

Bob King WD8DLH
7900 Blackshear Drive
Huber Heights OH 45420

I am looking for information on (and to buy) a National NCU-27 100 kHz calibrator.

Joseph Karr KA5RKD
R 2, Box 291
Lakeview AR 72842

I need information on a VIP switch for an Icom 22S.

David E. Quagliana K2MTW
115 Los Robles Street
Williamsville NY 14221

I need the owner's and/or service manual for the Gladding 25 2-meter FM transceiver. I will buy or pay any expenses.

John H. Cox KA4ZII
1815 Wood Avenue
Burlington NC 27215

Wanted: Someone knowledgeable (and with the necessary test equipment) who has built the satellite receiver, "Lite Receiver IV," featured in *73* during March through June, 1982. I need my receiver aligned and evaluated and lack the proper test equipment and antenna to do the job. I would be willing to pay UPS charges both ways, but due to being totally disabled and on a fixed income, I cannot afford a lot in the way of other charges.

Thanks a lot.

John W. McGuire K7ZVP
PO Box 577
Show Low AZ 85901

73 INTERNATIONAL

from page 76

QSO, and I gave Gerald 5/1 and he gave me 5/2. Gerald told me that he was using a simple ¼-wave antenna just above the roof. Later on, I shut down the station and went to bed. I took two tablets of painkiller to relieve my headache.

I was supposed to call my friend in Kota Kinabalu, 9M6MH, at about 1930 local time, but by then I was feeling too cold to be active again. There was no light in the shelter. We started a fire in the fireplace, but it died very fast because there was not enough wood. I finally slept at about 2000. I was told that the temperature at Panar Laban was about 6° C and it was about 2° C at the peak.

At about 0100 the next day, everybody woke up and had some canned instant noodles and warm coffee. We started to climb to the peak, 2,500 feet higher at 13,455 feet. It had been raining during the night. Since it was still dark, I used a torch light all the way.

We made another stopover at Panar Laban before going down to the National Park, and I had another QSO that morning from Panar Laban.

THE NETHERLANDS

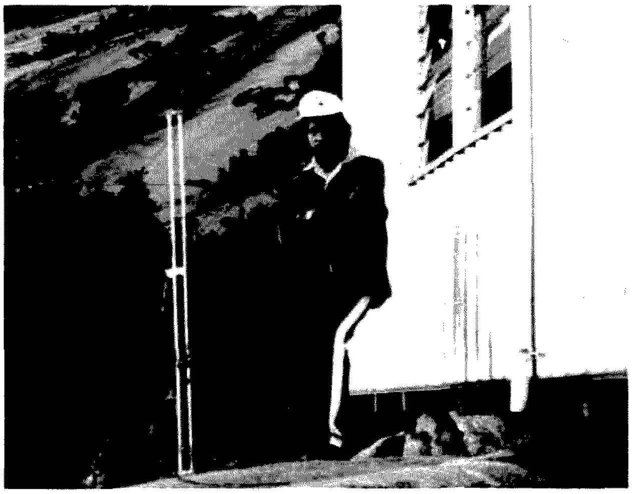
H. J. G. Meerman, Jr. PD0DDV
Zandvoorterweg 33
2111 GR Aerdenhout
The Netherlands

THE DUTCH PREFIX

In an earlier article, I told you about the different licenses in Holland: the A license for all bands and all modes, the B license for CW on some HF bands and all modes on 28 MHz and higher, the C license for all modes on 144 MHz and higher, and the D license for FM on two meters.

You can recognize a station's license class by its prefix (with some exceptions). In general, license class and prefix are as follows: A—PA0, PA2, PA3; B—PB0; C—PA0, PE0, PE1; D—PD0; Club stations—PI4; Repeaters—PI3.

On the way to Panar Laban. Left to right, Ismail, myself, Ahadiah, Teddy, and Sylvester.



At the Panar Laban shelter, about 1700 local time, with the Slim Jim at my right.

PI4NLB

This callsign is from the VERON club station in the region North-Limburg. It is on the air every Sunday morning from 1100 till 1200 UTC on 145.350, on FM, with regional news items. In the future, they will add some more frequencies.

THE DUTCH QSL BUREAU

The address of the Dutch QSL service is PO Box 330, 6800 AK Arnhem, The Netherlands. This Dutch QSL Bureau (DQB) sends all QSL cards from the members of the VERON and VRZA (the major societies in Holland) to every corner of the world. They collect the QSLs which are received at PO Box 330 and spread them among their members again. This gigantic service is free for hams and SWLs who are members of the earlier-named clubs. All the work is done by volunteers and their families in their spare time.

This year the DQB handled 1.5 million cards! I think that is a magic number!

THE HISTORY OF OM H. J. JESSE

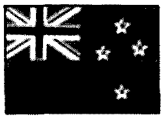
The name Jesse may say nothing to you, but let me tell you the story of this remarkable Dutchman. We go back to the year 1923, on the winter night of December 26. Mr. Jesse was the man who made the first contact with the States. He used then the call PC11.

Almost every part of his transmitter was homemade, because at that time shops where you could go for radio parts were not at hand. To assemble a radio transmitter, high technical knowledge was required.

Back in the twenties, radio amateurs like Mr. Jesse had no status. He couldn't get a license, and therefore his technical achievements were illegal. After his experiments, he was prosecuted by the authorities, and when his matter came to court, everyone was so thrilled by his achievements that, although they found him guilty, they did not lay any charges on him!

Last year in December, it had been sixty years since this pioneer had his contact with the States. For this occasion, Mr. Jesse was granted a full license; his callsign is now PA0C11.

I—and many hams with me—hope that Mr. Jesse makes use of this license, because who wouldn't like to have a QSO with such a remarkable man?



NEW ZEALAND

D. J. Chapmen ZL2VR
459 Kennedy Road
Napier
New Zealand

Last month I finished the section of the column on National Field Day activities in ZL with a mention of the usual weather conditions expected at that time of the year (February). How wrong I was!

National Field Day dawned to steady rain that had been falling from the early hours of Saturday morning. The same weather was predominant throughout the whole country. The rain continued for about 12 hours, easing just before the contest began at 1500 hours ZL time. So, as you can imagine, there were many very wet and miserable FD operators in action this year. A typical FD situation was as follows:

Arrive at the site about 10 am ZL time in fairly heavy and steady rain, to commence setting up the station. The first jobs are to set up the station's shelter and locate the portable generator. No doubt all outdoor types have attempted to put up tents in the wet; quite a formidable task, especially as the wind had just begun to get up a bit. However, after much difficulty, the shelter is erected and the two tents joined together with an access passage in case the rain continues all through the FD operating period. Meanwhile, a second team has set up the motor generator a reasonable distance from the station tents, placed a canvas shelter over the outfit to keep the rain off the motor and generator, and made several attempts to get the motor running.

Eventually the motor-generator is run-up and tested, much to the relief of the FD Controller, then shut down until later when the contest is about due to start. It is still raining, and now the wind has increased considerably. It *would* be like this, for now it is time to try to get the antennas up in the trees. While the other work had been progressing, a small team had been working to get the lines into the trees for the antenna supports. These vary from site to site, but everyone tries for the highest and best-located at their site.

Imagine trying to get lines up into large trees in these conditions. Yes, you have guessed—very frustrating, and there were many, many unprintable words spoken before the job was finished. There are many different methods used here: throwing pilot lines with a casting rod, using a kite and flying the lines into place, using a crossbow, and having a volunteer "idiot" climb the tree with the lines. Nevertheless, whatever method was used, all stations completed their antenna erections in atrocious conditions, with creditable results.

At one station I have heard of, the wind was blowing so strongly that branches from the 100-foot poplars were breaking off and adding to the hazards of the wind and rain. In fact, so I'm told, one fairly hefty branch hit the FD Controller's car parked nearby and caused panel-shop repairs amounting to over $300; can you imagine what his XYL said when he got home from Field Day? Just as well the branch didn't hit any of the FD team or there would have been graver problems than one damaged car.

Once the antennas were well on the way to being erected, then a small team began organizing the station setups for the 80- and 40-meter operating positions, one in each tent. When all the cabling and antenna connections were nearly completed, the generator was again fired up, the voltage adjusted to the load, and some test calls put out to other FD stations in a similarly wet state to ours.

After all seems well, the FD Controller allows the crew to have lunch and to try to dry off a bit. The wise ones in the team have brought a change of clothes and towels to dry off with. And while the FD team is having its first break since 10 am, the weather begins to clear. By the time the first FD calls were put out, at 1500 hours, the rain had stopped and the wind decreased a bit to make conditions a little bit more pleasant than they were a few hours earlier.

For the record, this year's ZL National Field Day attracted about 50 of the 79 eligible Branches into the field, with some of the larger Branches putting in more than one team. The number of Branches operating this year was less than last year, but than, 1983 was WCY year, and no doubt there was a bit of an extra effort and emphasis placed on last year's event for that reason. Nevertheless, it was still a good turnout, considering the atrocious condi-

tions during the setting-up period. As far as I can ascertain, only one team abandoned efforts because of the weather conditions, and this was a two-man team, so it was not too surprising.

1984 saw the first time that a full YL team operated. The "girls" were based at Inglewood in a mobile motor caravan, but even so had to contend with the wind and rain when putting up their antennas, etc. Another FD group with a difference was the station set up in a local school ground by an Auckland Branch as an amateur-radio PR exercise. The tents were erected in the middle of the school sports field, and there was suitable publicity in the local papers to encourage interested locals to visit and find out a little of what amateur radio is all about. I haven't heard how the response was, but while weather conditions on the Saturday were not good for the PR exercise, Sunday's weather was much improved.

There are always many hard luck stories from Field Day and no doubt many of these will continue to come out over the next few months, but the one I heard about was a real honey. The FD Controller had been chastising his team, urging them to try harder and make more contacts, etc., when it was time to check the motor generator for gas, etc. By now darkness had set in, so the job had to be done with a flashlight (very difficult holding a flashlight and filling the gas tank simultaneously) or by plugging in the service lamp. Well, the FD "boss" decided to plug in the service lamp. It had not been checked, and yes, you guessed right, it had a fault caused by the wet conditions; when plugged in, it upset the generator and put the station off the air. Mad panic! Get the standby generator! Attempts to start the standby failed! Then somebody decided to check the standby generator for gas. The tank was empty!

You can imagine the red face of the FD Controller. . .he has never lived that episode down and won't be allowed to forget it for many years to come. The "off-air" period was about 15 minutes at a prime time, so it was a bit embarrassing to the "boss man." Eventually, the main generator was restarted and the standby motor generator not required, but it was left gassed up just in case.

Front contenders for the FD contest honors will come from the following Branch teams: Manukau Branch ZL1QB, near Auckland; Auckland VHF Group ZL1BQ; Napier Branch ZL2ABJ; Auckland Branch ZL1AA; and Franklin Branch ZL1SA, near Pukekohe, south of Auckland.

BITS 'N' PIECES

I am including with this column a chart showing the ZL band plans, which should be of interest to amateurs worldwide. Our regulatory body, the NZ Post Office, in 1983 delegated the responsibility for planning within the amateur bands to NZART and amateurs themselves, and NZART accepted the task. The band plans are developed by the Frequency Management Working Group (FMWG) of NZART, based on IARU recommendations and local requirements, and all ZL amateurs are required to observe the published band plans "to assist others to follow their interests with a minimum impact on amateurs, and to assist amateurs to follow their interests with a minimum of impact on others."

In just over a year from now, ZL amateurs will host the IARU Region III Association Conference in Auckland from November 13-18, 1985, during IARU's Diamond Jubilee year. This will be the first time New Zealand has organized an International conference, and a fitting prelude to the NZART 60th Jubilee to be celebrated in 1986.

Silent keys of recent weeks include Bob Robertson ZL4AC, originally 4AC of Dunedin, a 60-year operator, who passed away on Christmas Eve, 1983. Also, Clem Smith ZL2DM of Gisborne, and Johnny Palmer ZL1KV of Mt. Albert, Auckland.

NEW ZEALAND BAND PLANS

These plans help you comply with the official Frequency Allocation List: "The class of emission from an amateur station shall be selected in the light of the total available bandwidth for all users and shall be in accordance with current operating practice." These plans represent current operating practice. See *Callbook* for designated frequencies and detailed band plans.

All amateurs are reminded of (1) The ITU Radio Regulations (Edition of 1982), including: 307. The bandwidths of emission shall also be such as to ensure the most efficient utilization of the spectrum; in general this requires that bandwidths be kept at the lowest value which the state of the technique and the nature of the service permit. 1804. All stations shall radiate only as much power as is necessary to ensure a satisfactory service.

(2) The New Zealand Radio Regulations 1970, including: 40. (Not to cause harmful interference to other stations). 45. (No monopoly of allocated frequencies). 147. (Permitted power limit).

(3) NZART Current Policy, Section 12A, Band Plans, (*Break-In*, page 2, October, 1983): d. All radio amateurs are requested to observe the published New Zealand band plans which are to assist others to follow their interests with minimum impact on you, and to assist you to follow your interests with minimum impact on others.

Band (MHz)	Emission (See notes)
1.8-1.95	6
3.5-3.55	N
3.55-3.9	6
7.0-7.03	N
7.03-7.3	6
10.1-10.5	N
14.0-14.1	N
14.1-14.35	6
18.068-18.11*	N
18.11-18.168*	6
21.0-21.1	N
21.1-21.45	6
24.89-24.93*	N
24.93-24.99*	6
27.12 ± 0.163	T
28.0-28.1	N
28.1-29.5	6,B,S
29.5-29.7	10
50.0-50.15	6
Amateur bands 51 to 440 MHz	30,B,R,S
Amateur bands 440 MHz to 1.3 GHz	7,B,R,S
All amateur bands above 2.3 GHz	W,B,R,S

*When available.

N = Narrow-band modes: i.e., CW and RTTY. RTTY operating is normally at the high-frequency end of the segment. *Callbook*-listed selcal (RTTY selective calling) frequencies should be avoided by stations using other modes. SSB phone may be used for Morse practice texts by stations in 3.53-3.55-MHz segment.

6 = All modes except MCW and AFSK, to a maximum bandwidth of 6 kHz.

10 = All modes except MCW and AFSK to a maximum bandwidth of 10 kHz.

30 = All modes to a maximum bandwidth of 30 kHz.

7 = All modes to a maximum bandwidth of 7 MHz.

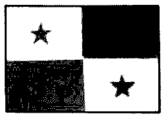
W = Wideband modes.

B = Beacons: Transmitting on *Callbook*-listed beacon frequencies should be avoided.

R = Repeaters: Transmitting on *Callbook*-listed repeater frequencies should be avoided for direct contacts in their service areas.

S = Satellites in current use: Terrestrial contacts are not recommended in the segments 29.3-29.5, 145.8-146.0, 435-438, 1260-1270 MHz and on higher satellite-used frequencies.

T = Telecontrol and telemetry only.



PANAMA

Robert H. Emerick
W4YTM/HP1XRO
President, Canal Zone Amateur Radio Association
PSC Box 2029
APO Miami FL 34002

It had been 15 years since Ms. Caballero, a resident of Marshalltown, Iowa, had left the Republic of Panama as a young child. In the interim, she had lost contact with her father, still in Panama. Her ardent desire to re-establish contact with her father and to rediscover her Panamanian roots inspired Marshalltown, Iowa, amateur-radio operator Fred Meyer NØCFJ to try to help her.

One of the calls he made just happened to be picked up by James "Red" O'Donnell HP1XJL, Panama Canal Commission supervisory power dispatcher, in the home of Occupational Health Division Chief, Dr. Ernst Kredel HP1XEK. Like Fred Meyer, Jim O'Donnell could not help but get into the act.

Armed with only a name and the information that Ms. Caballero's father had been both a barber and a firefighter, Jim visited Panama's Balboa Fire Station to ask the firemen (bomberos) there if they knew of such a man. By chance, one had heard of a Sergeant Alvarado who worked at Panama's international airport. Jim was then able to locate Mr. Alvarado and establish that he was Ms. Caballero's father.

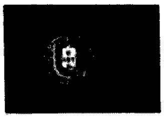
A phone patch was arranged through HP1XEK to allow father and daughter to speak, although the conversation was somewhat impeded by the fact that he spoke no English and she no Spanish. The hams were thrown into the conversation as translators.

Before long, Mr. Meyer and the fire department in Iowa were raising money to send Ms. Caballero to Panama. In Panama, a number of firefighters and ham operators were making arrangements for Ms. Caballero's arrival. These included Commission civil engineer Tomas Duque, treaty affairs specialist Robert Emerick HP1XRO, Graphic Branch equipment specialist Bob Rodgers HP1XRQ, Commission Fire Chief Jaye Dietz, and Republic of Panama bombero Capt. Christian Arnheiter. Overwhelmed by all their assistance, Ms. Caballero said, "This is simply fantastic. I had no idea so many people cared!"

Ms. Caballero's 10-day visit was characterized by a whirlwind of activities. She met with representatives from, and visited points of interest in, both Panama and the Canal area, including the Miraflores Locks and other Commission facilities. But the highlight of the trip was, of course, getting reacquainted with her father. Once again, ham radio brought

From left to right, James O'Donnell KB4HMO/HP1XJL, Robert Emerick W4YTM/HP1XRO, Dr. Ernst Kredel WA7ARU/HP1XEK, Ms. Nora Caballero, her father, Anival Alvarado, and Bob Rodgers HP1XRQ.

some happiness to people at different locations in the world.



PORTUGAL

Luiz Miguel de Souse CT4UE
PO Box 32
S. Joao do Estoril
2765 Portugal

Let me introduce you to two very interesting Portuguese awards, sponsored by REP:

(1) *DMP-WPW—Worked Portuguese World.* QSO or SWL ten different stations in ten Portuguese possessions, using any mode or band after July 29, 1947. Countries are: Portugal, Azores Islands, Madeira Island, ex-Portuguese India (not required), Cape Vert Island,* St. Tome and Principe Islands,* Angola,* Mozambique,* Portuguese Timor,* and Macau. (An asterisk means contacts made during the Portuguese administration of that country.)

(2) *DPCI—Worked Portuguese Provinces.* QSO or SWL 50 different CT stations, with 26 contacts in different provinces and islands, using any mode or band after January, 1952. Minimum QSOs with each province: Traz os Montes e Alto Douro—1, Minho—1, Douro Litoral—5, Beira Litoral—1, Beira Baixa—1, Beira Alta—1, Estremadura—10, Ribatejo—1, Alto Alentejo—1, Baixo Alentejo—1, Algarve—1, Acores—1, Madeira—1.

For these two awards, submit QSLs or list certified by an IARU-affiliated radio society and send to REP-REDE Dos Emissores Portugueses, Rua D. Pedro V, 7/4, Lisbon, Portugal, and do not forget to include 3 or 4 IRCs to cover the expenses.

As said before, the country is covered by some repeaters for VHF and UHF. A repeater's frequencies are established according to the IARU Region I band plan for VHF. So these are the repeaters, followed by their locations.

R9—CT6SE (Serra da Estrela)
R1—CT9LO (Lousa)
R2—CTØFO (Fola)
R2—CT9LE (Leiria)
R3—CTØFF (Figueira da Foz)
R3—CTØMAD (Pico Silva—Madeira)
R4—CT9MS (Monsanto—Lisbon)
R4—CTØMA (Serra do Marao)
R5—CTØSM (Cerro S. Miguel)
R5—CTØSA (Castelo Branco)
R6—CT9MO (Montejunto)
R7—CT9AR (Arrabida)
R7—CTØSL (St. Luzia—Viana do Castelo)
R8—CTØSI (Sintra)
R9—CTØES (Estremoz)
R9—CTØVA (Valongo)

UHF

RUØ—Monsanto
RU1—Serra da Estrela

In Lisbon with a hand-held, try R4, R7, R8, and RUØ.

Operating Advice For Licensed Radio Amateurs, the new publication issued by the IARU, is very helpful for new hams in order to guide them in a good operation in the DX frequencies.

According to a proposal presented by GRA (Grupo de Radioamadores do Algarve), the local administration deliberated that those interested could use other prefixes during WCY/83 instead of the well-known CT that we use daily. So, during that period of time, a lot of Portuguese hams activated CO, CR, CS, and CU.

Some of these prefixes have been in QRT since the independence of the ex-Portuguese colonies in Africa, if we all remember the old good days back in 1974/5 in Angola CR6 (CQ6, XX6), Mozambique CR7, Portuguese Guinea CR3, S. Tome and Principe Island CR5, and Cape Vert Island CR4.

It is real nice when we have other prefixes in contests.

I still remember when I went on the air using CR6UE, CQ6UE, and XX6UE in that time. We had a lot of fun. But this isn't all. We just received information from Macau CR9 saying that they would be using XX9 in the very near future.

It is a good chance to increase our WPX list.

DXPEDITION TO BERLENGA ISLAND

Four REP members, CT4UW, CT4NH, CT1AFN, and CT1CEX, were operative last March from Berlenga Island, 6 miles off the Portuguese coast at the city of Peniche, working a very special (1st World) callsign, CTØBI.

Berlenga is valid for the IOTA Award (Islands on the Air), having IOTA's number EU-40, and obviously good for WPX hunters.

The operation took place from the existing lighthouse, under Portuguese administration. Transportation and other facilities were graciously given by the Portuguese Navy. QSL cards via home calls (*Callbook* address). More about this later.

CRC—CLUBE DE RADIOAMADORES DE CASCAIS

This is a result of the efforts undertaken by a group of hams living in the municipality of Cascais. This ancient village, founded in 1400, is situated 12 miles west of Lisbon and 6 miles from Roca's Cape, where the European continent just begins.

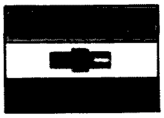
The area is surrounded by beaches, nice hotels, golf courses, souvenir shops, and, of course, the typical restaurants in which you must try the real Portuguese cuisine.

CRC is sponsoring two interesting awards for licensed amateurs as well as SWLs worldwide:

1) *100 CT Award.* For this one, contacts must be made after February 13, 1984, with 100 or more different CT stations, with at least 3 CT3 (Madeira) and CT2 (Azores) stations.

2) *CCA—Cascais County Award.* Contacts after February 13, 1984, with the six administrative divisions in Cascais County: Alcabideche, Carcavelos, Cascais, Estoril, Parede, and S. Domingos de Rana.

These two awards are issued for any band, CW or phone, as well as mixed- and single-band accomplishments. To apply, a list of contacts must be verified by two amateurs or local radio-club officials. Send a list plus 12 IRCs or US$5.00 to CRC Award Manager, PO Box 209, 2752 Cascais, Portugal.



REPUBLIC OF SOUTH AFRICA

Suid-Afrikaanse Radioliga
Tak Durban Branch
Posbus 1058 PO Box
Durban 4000
Republic of South Africa

On May 31, 1984, to celebrate Republic Day in South Africa, the Durban Branch of the SARL will operate special callsign ZS5RSA. The operation will cover 3.5–28 MHz, CW and SSB, as far as band conditions permit. This is the fifth consecutive year that this activity has taken place and it has proved very popular. A special QSL card is normally issued for contacts with this station.

de Bruce P. Dunn ZS5XT

TRINIDAD AND TOBAGO

John L. Webster 9Y4JW
c/o Department of Soil Science
University of the West Indies
St. Augustine
Trinidad
West Indies

The biggest event in the WCY 1983 TTARS calendar occurred during the last week of October. This event was a national exhibition on communications in which the TTARS participated. It was a major contribution by the government of Trinidad and Tobago to World Communications Year.

The exhibition was officially opened on Sunday, October 23, by the President of the Republic and was open to members of the public daily between the hours of 10:00 am and 9:00 pm, until Saturday, October 29th. There were exhibitors from all sections of the commercial communications field, and many computers were in evidence.

The TTARS prepared an impressive exhibit in its attempt to educate the public about amateur radio. Brochures describing our hobby were prepared and distributed to all visitors to our booth. We attempted whenever possible to have three stations operating simultaneously, one on VHF simplex or the local repeater and the other two on the HF bands. Whenever we had two HF stations on simultaneously, we tried to utilize two different modes in order to demonstrate the versatility of this exciting hobby. The modes we were able to demonstrate were SSB, CW, and RTTY. Unfortunately, for much of the exhibition the propagation was poor, but about 1000 QSOs were logged using the special callsign 9Y4WCY. (Anyone wishing to confirm a QSL with 9Y4WCY should QSL to 9Y4TT.)

The antenna systems in use at 9Y4WCY consisted of two three-element triband yagis for 10, 15, and 20, a longwire for 80, and a KLM four-element yagi for 40. The latter presented quite a challenge both in finding a suitable site on which to position it and also in the actual erection of the beam. It was eventually placed, with the aid of a mobile crane, on a tripod on the top of the elevator shaft of the building housing the exhibition, at about 25 meters above ground level.

We also had all of the components of a satellite station on site with the expectation that we would be able to work OSCAR 10. Unfortunately, this was not to be, as problems developed with the equipment. When these problems were eventually sorted out, it proved impossible to hear the satellite due to the extremely high level of VHF/UHF interference being generated by the large number of computers and other communications equipment in operation on the site.

This was a great disappointment to us, but we were still able to explain amateur satellite communications to our visitors through the use of posters, brochures, and with the aid of the AMSAT AMS-81 tracking program running on the low-cost Timex TS-1000 computer.

Other exhibits included a comprehensive publications display, vintage equipment, a display showing the progression of technology from tubes to integrated circuits, an assortment of maps and posters, home-brewed equipment, and a selection of QSL cards and amateur-radio awards.

The WCY exhibition was the first real exposure to the public that amateur radio here has received. It was quite a success for the TTARS as several thousand persons visited our booth and 40 new associate members have joined the Society as a direct result of the exhibition. Most of them are now attending our current training program.

Several companies and individuals provided much of the material used to help make the show the success it was. The TTARS would like to publicly thank the following for their contributions: ARRL, RSGB, JARL, AMSAT, *CQ*, *73*, *Radio Amateur Callbook, Inc.*, Varian EIMAC, Kantronics, RCIS, Inc., Computer Applications, RCA, KØRZ and KØCY of AMSAT Software Exchange, Bob Jackson AG5X, and Jack Gutzeit W2LZX.

1983 was the year that the personal computer age really got off the ground here in Trinidad and Tobago. In the latter half of the year, many of the hams got into the act as well. As a result, the need arose for some guidance in programming in Basic for the newcomers from some of the more experienced computer hackers. This took the form of half-hour lecture/discussion sessions on the air during the weekly 9Y net, conducted by Russ 9Y4RB and Lloyd 9Y4DK. This net meets every Sunday at 1300Z on 7.159 MHz.

The final notable event in the 9Y calendar occurred with the launch of STS-9, *Columbia*, with Dr. Owen Garriott W5LFL on board. The possibility of working W5LFL stirred up considerable interest here. On Friday, December 2nd, between 2322Z and 2330Z (Orbit 70D—the only one on which Dr. Garriott was supposed to be operating that really favored Trinidad), there were at least a dozen 9Y stations keeping a racket on W5LFL's range of listening frequencies . . . but it was all to no avail. Not a peep was heard from *Columbia* and there were a lot of disappointed hams here in Trinidad. We are hoping for better luck next time!

HAM HELP

Am interested in modifications for a Standard C-118 2m HT, especially how to reduce the output power.

Tim Moore KL7PF
1117 "A" Street
Juneau AK 99801

I need a copy of the schematic and manual for a DuMont Mod. 274 oscilloscope. I will gladly pay copy and postage costs.

Robert A. Johnson N7CFX
833 E. Gwinn Place
Seattle WA 98102

DEALER DIRECTORY

Culver City CA

Jun's Electronics, 3919 Sepulveda Blvd., Culver City CA 90230, 390-8003. Trades 463-1886 San Diego, 827-5732 (Reno NV).

Fontana CA

Complete lines ICOM, DenTron, Ten-Tec, Mirage, Cubic, Lunar, over 4000 electronic products for hobbyist, technician, experimenter. Also CB radio, landmobile. Fontana Electronics, 8628 Sierra Ave., Fontana CA 92335, 822-7710.

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Bay area's newest amateur radio store. New & used amateur radio sales & service. We feature Kenwood, ICOM, Azden, Yaesu, Ten-Tec, Santec & many more. Shaver Radio, Inc., 1378 So. Bascom Ave., San Jose CA 95128, 998-1103.

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Factory Authorized Dealer! Yaesu, ICOM, Ten-Tec, KDK, Azden, AEA, Kantronics, Santec. Full line of accessories. No sales tax in Delaware. One mile off I-95. Delaware Amateur Supply, 71 Meadow Road, New Castle DE 19720, 328-7728.

Boise ID

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Preston ID

Ross WB7BYZ has the largest stock of amateur gear in the Intermountain West and the best prices. Call me for all your ham needs. Ross Distributing, 78 So. State, Preston ID 83263, 852-0830.

Littleton MA

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Ann Arbor MI

See us for products like Ten-Tec, R. L. Drake, DenTron and many more. Open Monday through Saturday, 0830 to 1730. WB8VGR, WB8UXO, WD8OKN, and W8RP behind the counter. Purchase Radio Supply, 327 E. Hoover Ave., Ann Arbor MI 48104, 668-8696.

Livonia MI

Complete photovoltaic systems. Amateur radio, repeater, satellite, and computer applications! Call Paul WD8AHO. Encon Photovoltaics, 27600 Schoolcraft Road, Livonia MI 48150, 523-1850.

Hudson NH

Look!—hams, SWLs, and experimenters: parts, books, gear, antennas, towers. Call for quotes. Polcari's ELECTRONICS CENTER, 61 Lowell Road (Route 3A), Hudson NH 03051, 883-5005.

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Kenwood, ICOM, Ten-Tec, Belden, Cushcraft, Larsen, Hustler, ARRL, Hy-Gain, B&W, MFJ, Mirage. New and used equipment. Serving the amateur community since 1942. Adirondack Electronics, Inc., 1991 Central Avenue, Albany NY 12205, 456-0203 (one mile west of Northway exit 2W).

Columbus OH

The biggest and best ham store in the Midwest featuring Kenwood and other quality products with working displays. We sell only the best. Authorized Kenwood service. Universal Amateur Radio, Inc., 1280 Aida Dr., Reynoldsburg (Columbus) OH 43068, 866-4267.

Dallas TX

IBM PC/XT kits, supplies, expansion products; video restorer kits for pay TV, CATV, satellite hobbyists' electronic project kits/app-notes. More than 9000 parts in stock: semiconductors, ICs, discretes, video accessories, tools, audio, automotive, cabinets, computer peripherals. Please write for your free 60-page catalog: Sabet Electronics, 13650 Floyd Rd., Ste. 104, Dallas TX 75243; 783-4950 (formerly I.E.).

DEALERS

Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the September '84 issue must be in our hands by July 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7A	14	14	14	14
ARGENTINA	21	14	14	14	7	7	14	14	14A	21A	21A	21
AUSTRALIA	21	14	14	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	14A	14	14	7	7	7	7A	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7A	14	14	14A	14A	14	14
HAWAII	21	14	14	7	7	7	7	7	14	14	14	21
INDIA	14	14	7B	7B	7B	7B	14	14	14	14	14	14
JAPAN	14	14	7B	7B	7B	7	7	7	14	14	14	14
MEXICO	14	14	14	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	14	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7B	7	7	7	7B	14	14	14	14A	14A	14	14
U.S.S.R.	14	7	7	7	7	7B	14	14	14A	14A	14	14
WEST COAST	14A	14	7	7	7	7	7	14	14	14	14	14A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7A	7	7	7	7	14	14	14	14
ARGENTINA	21	21	14	14	7	7	14	14	21	21A	21A	21
AUSTRALIA	21	14	14	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14	14	7	7	7	7A	14	14	14A	21	21A
ENGLAND	14	7	7	7	7	7	14	14	14	14A	14	14
HAWAII	21	14	14	7	7	7	7	7	14	14	14	21
INDIA	14	14	14	7B	7B	7B	7B	14	14	14	14	14
JAPAN	14A	14	14	7B	7B	7	7	7	14	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14A	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	14	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7B	7	7	7	7B	7B	14	14	14A	14A	14	14
U.S.S.R.	14	7	7	7	7	7B	14B	14	14A	14	14	14

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	14	14	14	14
ARGENTINA	21	21	14	14	7	7	7	14	21	21A	21A	21
AUSTRALIA	21A	21	14A	14	14	7A	7	7	7	7B	14	21A
CANAL ZONE	21	14	14	7	7	7	14	14	14	14	21	21A
ENGLAND	7A	7	7	7	7	7	7	14	14	14	14	14
HAWAII	21A	21	14	14	14	7	7	7	14	14	21	21
INDIA	14	14	14	14	7B	7B	7B	14	14	14	14	14
JAPAN	14A	14	14	14	14B	7	7	7	14	14	14	14A
MEXICO	14	14	14	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14	14	14	14B	7B	7B	14B	14	14	14	14A
PUERTO RICO	14A	14	14	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7B	7	7	7	7B	7B	7B	14	14	14A	14	14
U.S.S.R.	14B	7B	7	7	7	7	7B	14B	14	14	14	14
EAST COAST	14A	14	7	7	7	7	7	14	14	14	14	14A

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

June

SUN	MON	TUE	WED	THU	FRI	SAT
1 F/G	2 F/G	3 F/F	4 F/G	5 G/G	6 G/G	7 F/G
8 F/G	9 G/G	10 G/G	11 G/G	12 G/G	13 G/G	14 G/G
15 F/G	16 F/F	17 F/F	18 F/F	19 P/F	20 P/F	21 P/F
22 P/F	23 P/F	24 F/F	25 F/G	26 G/G	27 G/G	28 G/G
29 F/F	30 F/F					

International Edition

July 1984 Issue #286
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73 T.M.

Amateur Radio's Technical Journal

A CWC/I Publication

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- W2NSD—Page 6

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How To
- Run Novice Classes—Page 26
- Pass FCC Exams—Page 30

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Czechoslovakia
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More V
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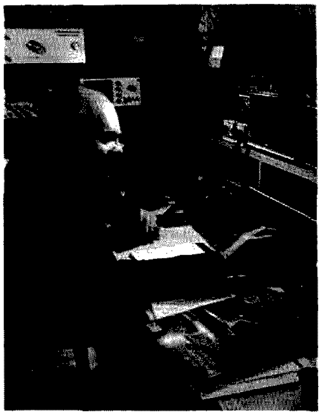
Dayton—10

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green



THE HAMVENTION

Dayton was as big as ever—or bigger. Hara Arena was pretty full on Friday, packed on Saturday, and pretty full on Sunday with hams not just from the midwest, but from all over the world. There was even a ZS contingent from South Africa wondering when I was going to get back down to visit them again.

A handful of old-timers groused about my 35-wpm petition, but 99% got the point and enjoyed it. Some *73* readers were suckered in by media reports and did Archie Bunkers. (See my talk.)

A few years ago, I got to talking on Friday—mostly because the meeting rooms they had available then were so noisy on Saturday as to be almost impossible. They've built some new (quiet) meeting rooms, so I hope to be invited to do a Saturday talk next year.

Yes, I enjoy the acclaim I get—It helps a lot when I get to feeling discouraged. I get more pleasure than I can describe when I meet people at shows who tell me that my talks or editorials inspired them to change.

If you haven't been making the yearly pilgrimage to Dayton, maybe 1985 is the year to get off your duff. These DARA fanatics have their Hamvention worked out in every detail (and I emphasize the word *work*). Zillions of prizes, all reported on computer monitors. Somehow, they manage to guide the cars bringing over 20,000 hams into neighboring fields. They even have the incredible flea market well organized. It goes on for acres—the biggest one I've ever seen. I spent a couple hours walking around it this year and didn't even cover half of it. You wouldn't believe the amount of stuff there! You can find any model rig or receiver ever made, any test equipment, any radio part, any tube, transistor, IC, wire of any kind, coax, connectors, and so on. It's all there at prices that are hard to pass up.

If you want weather stations, laboratory clocks, muffin fans, relay racks, hi-fi, lo-fi, an old Emerson radio, Teletype®, relays, telephones, slow-scan, RTTY—you name it and it's there on hundreds of tables. There were even some EE8A WWII surplus telephones and some Gonset Communicators. I thought those had reached their final resting ground long ago.

The temperature went from the 40s the day before up into the 80s for the hamfest, forcing me to grovel at the Kenwood booth for a hat to keep what's left of my brains from frying while I was doing the flea market.

At the *73* booth, I shook a lot of hands, got my ego properly rebuilt, and met an enormous number of old friends. Larry Horne N2NY was there. He used to work for me almost 30 years ago. He's worked out some really fast Morse-code teaching techniques and has been reputed to get newcomers started at 50 wpm and copying in one weekend. Why spend months starting at 5 wpm and gradually relearning the code all the way up, driving yourself and your family crazy, when you can just as easily start out at 50 wpm? I dunno if these people can copy 5 wpm or not...probably not. Probably not even 13 per, but at 50...no strain.

If you're going to make it to Dayton next year, be sure to drop me a QSL card and let me know what subjects you'd like me to talk about. For that matter, if there's something you think I should cover in an editorial, hey, this is a two-way street.

Some ham dropped by the booth and beefed to Jim Gray W1XU that Wayne has his editorial and that the readers have no way to be heard. Jim asked him if he'd written a letter to the editor. Grumble, no. So write one, said Jim. A couple minutes later, the same chap started loudly with the same theme, more interested in generating a fuss than in accuracy. Letters with anything worthy of being printed will be printed. General beefs or emotional harangues probably won't make it—unless our Executive or Managing Editor wants to expose the vacuity of thought which characterizes some letters.

On the whole, I'm awfully proud of *73* readers. You are, with very few exceptions, intelligent and perceptive people. I don't write for 12-year-olds. I write for intelligent hams and most readers respect this. The 12-year-olds, of all ages, can have problems understanding me.

THE DAYTON TALK

[At 2:00 pm on April 27, Hara's Room 2 hosted W2NSD's yearly report on where amateur radio is today and where it could be tomorrow. And what to do about it. We hope you enjoy this transcript of some of his remarks. —JCB.]

Good afternoon. I'm Wayne Green W2NSD. And I understand that you read my editorials but don't agree with them 100 percent. [Loud guffaws. —Ed.]

So on that basis...had a number of questions asked me since I've been here. And I'll try to address most of those, if I can. If I forget some of them, make a note and ask me later, and I'll try to cover whatever I've forgotten about. But, in general, I cheat on my talks. I don't plan much ahead. And I figure either I'll think of what I was supposed to talk about or you'll remind me.

Now, since my talk last year, we've had a few minor changes in my organization. And those of you who read the magazine are aware that basically I sold all of the Wayne Green, Incorporated, magazines to another company, IDG, International Data Group, who publishes *Computerworld* and about 50 magazines in 18 countries. It makes it very handy for travel—there is always a company office there.

I got a good deal out of it, as you may have read. And people keep wanting to know, "What are you going to do with the 60 mill?" [Guffaws.]

Well, I'll tell you. I'm going to try to put it to the best use I can and do my very best to make an awful lot of people very wealthy. It's an old story that you can't take it with you. And indeed, the agreement I made was that whatever's left over when I leave goes back to the company.

Now, all of the reasons that I made that arrangement—one of the reasons that I made the deal with IDG—is that they were aiming in the same direction that I was. It was my intention to take Wayne Green, Incorporated, and eventually have the employees own it. IDG is doing the same thing. And indeed they have turned a substantial percentage of the corporation over to the employees' fund already. And the schedule eventually will be 100 percent of it. ["Superham" Don Wallace W6AM enters room and sits down in front row.]

With the bo-nanza, I have formed a new company called Wayne Green Enterprises. And I have a number of projects in the works with that. And I'll tell you about some of those because they have a lot to do with my background in amateur radio. (Hi, Don, good to see you. Delighted that you could come.) And I think that I have some plans that may eventually help amateur radio a lot.

We're starting out, essentially, with a new publishing organization. And in order to get the people to do this, I'm starting a

publishing school. And we have about 10 magazines lined up to get started with the people that we train in this school. And, of course, the people who do well in school we'll put on the new publications. The people who do poorly, we'll sell to our competitors. [Chuckles.]

The new magazine, the first one, will be *Digital Audio*. And how many of you are not familiar with digital audio in the compact disc? Are any of you out of communication with the world? [Chuckles.] OK. Well, perhaps you remember the 78-rpm record. And then there came along a newfangled contraption called a long-playing record which within a few years put the 78-rpm record out of business.

Well, there is a new technology called digital audio which is going to put the LP out of business in a very few years. And the new record is the compact disc which is about yea big. And it is written on and read by laser. And it is so phenomenally better than LP records that you have to hear it but once to be addicted to this new sound. For the first time, when you listen to hi-fi, you can hear the sound of silence. And for you technical people, you have the potential with this new recording medium of a 95-decibel range of sound (where on an ordinary record about the best that they can do is around 60 dB). So it's thousands of times better. Well, we're going to try to help this industry, this brand new industry, to grow with a magazine.

The second magazine will be in the telecommunications field and this will be for businessmen so that they will be able to cope with these new telephones and new types of communications that are on the market. Right now, I know of no magazine out there for businessmen to tell them what these things do.

We have two or three computer magazines in the works. And one would think that with 300 magazines on the market that there would be enough, but there still is a need for a few more that other people have not yet perceived. And we will be proceeding with that.

Now, perhaps even more important, once we have gotten things running fairly smoothly with these relatively easy magazines, we have two huge ones in the works. And when I say huge, I mean circulation on the order of 10 to 20 million. What I intend to do is take the 60 million [dollars] and within four years build that up to one billion. And I think we're going to be able to do it. And I believe that every person that works for us is going to be, at the minimum, a millionaire. My calculations are that within four years they should be worth approximately 1.6 million each. Because we're putting aside part of the stock and the people who work for us have a share in the company.

The big magazine—and the one that is going to be the most important to amateur radio—will have to do with teenagers. And basically, we want to start a magazine which is an instruction book for growing up. And you can bet that it is going to be very heavily laced with high tech. It'll encourage kids to be interested in amateur-radio communications, to be interested in computers.

I think all of you are well aware of what's happened in computers. How many of you here have Model 100s already? One, two, three, four, five, not bad, six, seven, right. A year from now, I suspect there will be at least ten times that many in the audience that have briefcase portable computers. But these computers are just part of it. It's what these are going to force to happen that is important. And that is the key for anyone who would really like to make money, because these small computers are going to require communications.

Right now, you can plug this [holds up Model 100] into the telephone and you can communicate through hundreds, any of hundreds, of bulletin boards, communications services, and so forth. The next step—and it's something that we could do with amateur radio *right now*, if we wanted, with our current technology—any one of you could probably do this if you'd sit down and do it. And that is put a small relay transmitter in here, probably 149 Megahertz, and make it so if you use this within the room with a small room repeater, it would pick up the information from that so you don't have to plug it in anymore. And you could hook that onto the telephone. That's the first step.

The next step is to have an area repeater so that the room repeater goes to your area repeater. Any of your regular repeaters that you have today could do this. Have the area repeater, say, every five minutes, or every three minutes, or every minute, send a pulse out with a coding for your particular computer and it says essentially, "Are you turned on? Do you have any traffic?" And your computer, if you have it turned on, will say, "Yes, I'm turned on, I have no traffic," every so often. It will take a few milliseconds to do it.

Once you *have* written the message to someone *anywhere in the world* and you say "Go," the next time you are polled by that local repeater through your room repeater, it will say, "Yes, I have traffic." And it will dump it *with error-correcting* at *25,000 words a minute.*

And that will be stored in your local repeater, which will then look up to see where-in-the-devil this thing is going and route it either to another repeater or to a local recipient or perhaps by a satellite link to somebody down in Ceylon [Sri Lanka] who was sitting on the beach with another system. Or to his home repeater waiting for when he comes home and turns on his unit and it finally says, "Yes, I'm here, is there any traffic?"

We can do that with the technology we have today. Nobody has to invent a *thing*. We just have to *do* it.

If you do it, you know as well as I do that there is no power on Earth going to stop that from selling. It is a service that is needed desperately. And some bright person somewhere is going to do that and going to become incredibly wealthy and you're going to say, "Gee whiz, look at that, how did he do that, wasn't he lucky?" I find that the harder I work, the luckier I get.

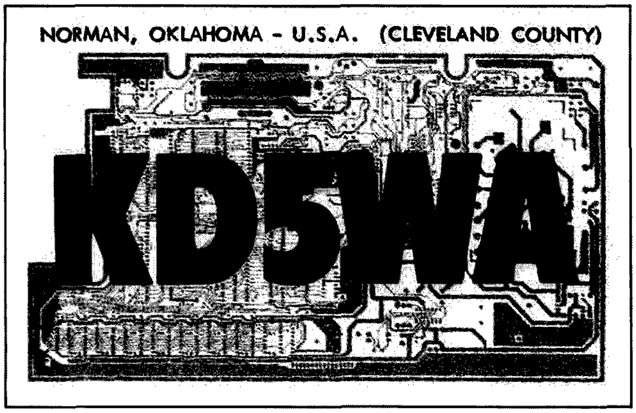
So these things are there. We are going to need communications in 10 years that are on the order of a thousand times—maybe ten thousand times—what we have today. And that means that we are going to need ten thousand times as many engineers and technicians as we have today.

Now, I'm sure that most of you are aware that the growth of amateur radio last year was two and a half percent. And that this year we're looking for a net loss. Unless something changes radically. I'm sure you're *also* aware that the growth of amateur radio in Japan last year was 25 percent and has averaged, over the last 20 years, over 300 percent a year. It slowed down a little bit in the last few years. We have averaged for the last 20 years a growth of 2 percent. Average. Two point zero percent in the United States.

I wrote in *73*—a couple of years ago—an editorial, and I said I bet you it isn't going to be long before our military are sending electronic development contracts to Japan. And I got the biggest bunch of hee-haws from the readers. And they said, "Boy, are you crazy." Big headlines about four months ago: The military tried to get electronic contracts with Japan for military equipment development and they turned us down.

I'd like to do something about that. I'd like to reach teenagers and interest them in amateur radio. In the United States, we

Continued on page 76



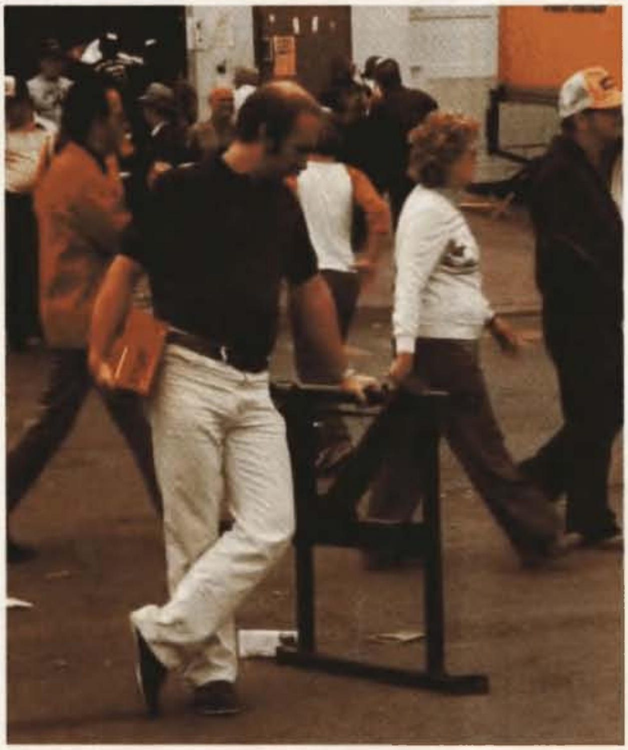
QSL OF THE MONTH

To enter your QSL, put it in an envelope along with your choice of a book from *73*'s Radio Bookshop and mail it to *73*, Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Entries not in envelopes or without a book choice will not be accepted.

Perry Donham KK2Y
73 Staff

Shoot at Will

KK2Y's Dayton mandate was to capture things on film. He did it. Enjoy a slice of Hamvention.

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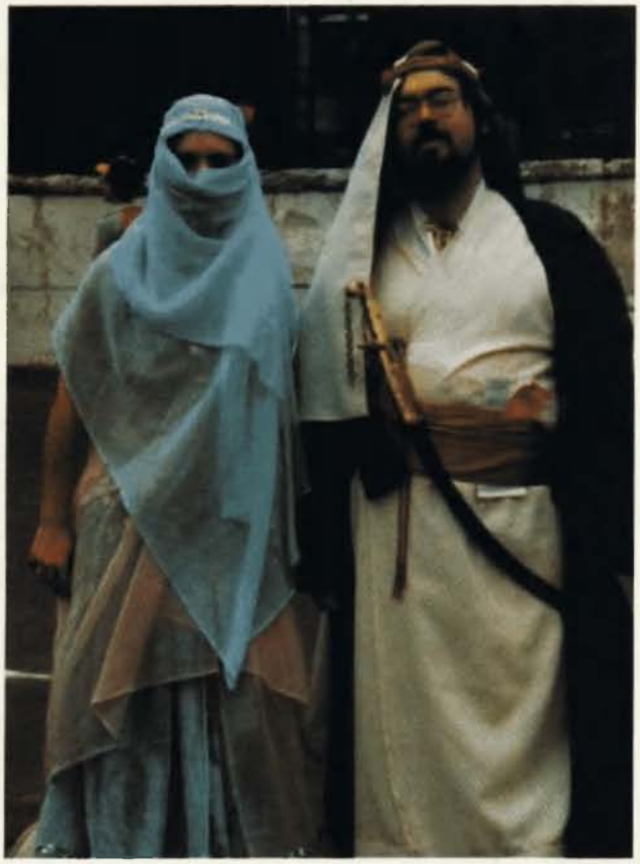
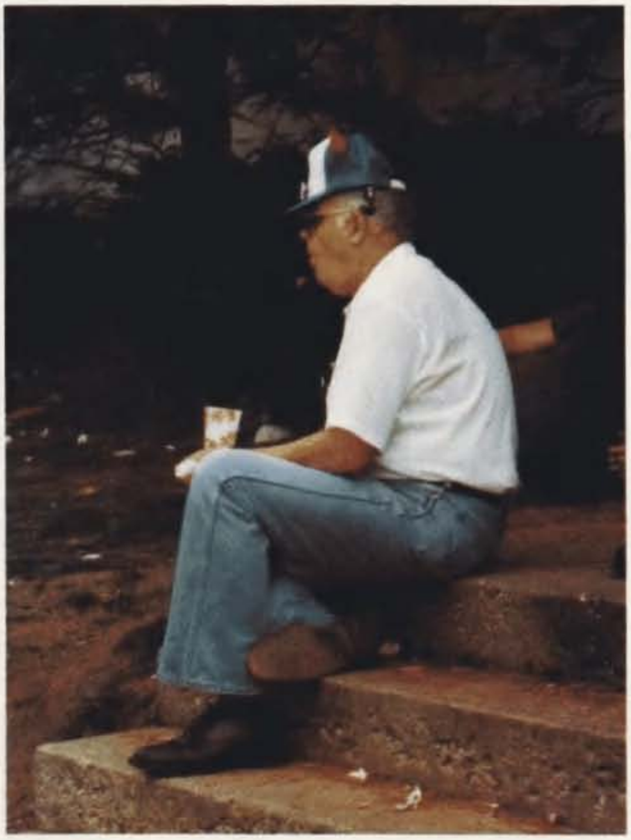
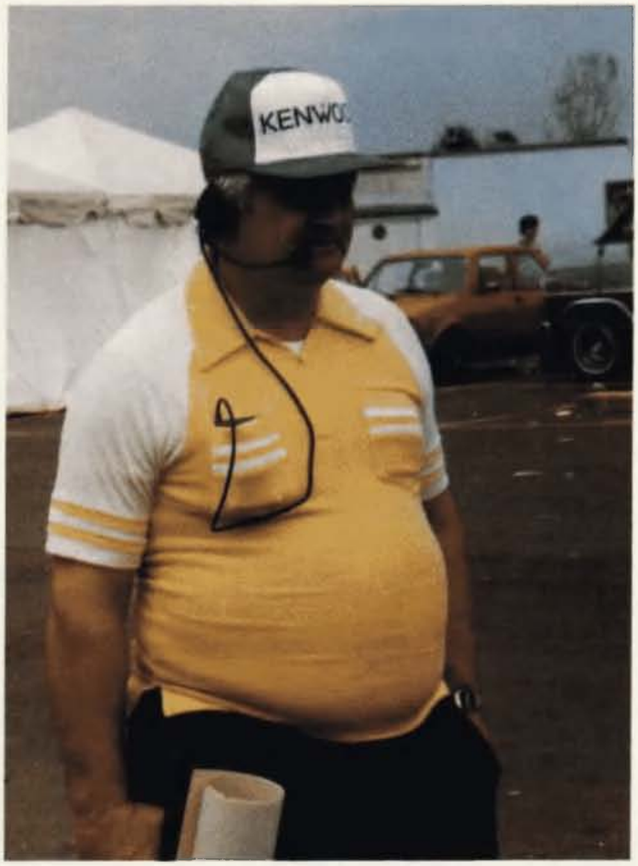




DARA boys (L-R) Terry Falkner N8EEO, Joe Moore K8VAZ, Jim Orihood WD8JCI.

Jack Mitchell AA8Q, General Chairman, with W2NSD.

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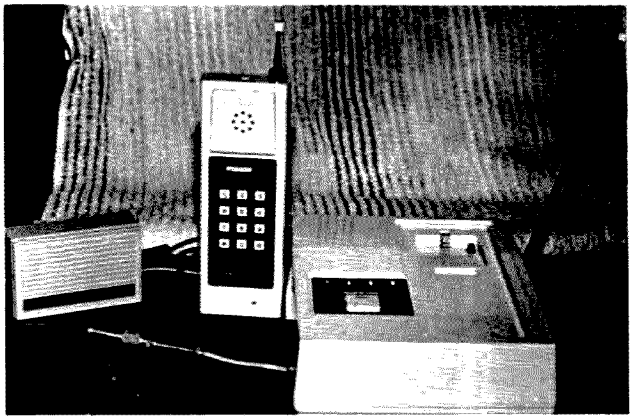
Secrets of Cordless Phones

Is privacy sacred and range not?
Maybe some hands-on research can help you decide.

I purchased a wireless telephone some time ago. Being curious about electronic gadgets, I did some hands-on research by examining the electronic innards and came up with a few mods and suggestions to make it even more useful. Wireless phones employ full-duplex operation and consist of two parts. The hand-held unit transmits on 49 MHz and is crystal-controlled. The base unit transmits on about 1700 kHz but uses an LC circuit. Its frequency can be adjusted by a tuned slug. Both operate in the FM mode. There are several ways to increase the phone's range and still preserve your privacy and avoid interference.

First of all, if you are considering the purchase of a wireless phone and you already own a programmable police scanner, enter in the following frequencies: 49.830, 49.845, 49.860, 49.875, and 49.890 MHz. Scan these five channels for a few days to get an idea which frequencies are most populated in your neighborhood. Using a Bearcat 250 with an outdoor antenna, I was able to get clear reception for over one-half mile. You may hear a juicy thing or two because people just don't realize others can listen in. For this reason, avoid initiating credit-card calls over a wireless phone. Remember, you'll only hear one side of the conversation—the hand-held unit's side. The other side of the phone conversation is carried on 1695, 1725, or 1755 kHz, although there are a few newer designs which duplex both sides of the conversation in the 49-MHz band.



Amplifier speaker, hand-held unit, and base unit.

The 49-MHz frequencies are designated as channel numbers or letters. For example, 49.830 is channel 1 or A, 49.845 is channel 2 or B, and so on. The wireless phones are usually marked on the outside of the box they are packed in which channel they operate on. In my neck of the woods 49.845 MHz seemed to have the least amount of traffic so I purchased a unit marked "channel 2." It's a good idea to avoid channel 3 or C (49.860). All the new unlicensed kid handie-talkies operate on this frequency these days, and even though they are AM, you will still receive some interference. If you don't have a scanner to check out the neighborhood frequency usage, you'll have to take pot luck. Just avoid channel 3 or C. If you purchase a wireless phone by mail, state which channel you wish. You may not get what you want but it's worth a try.

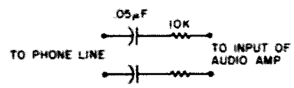
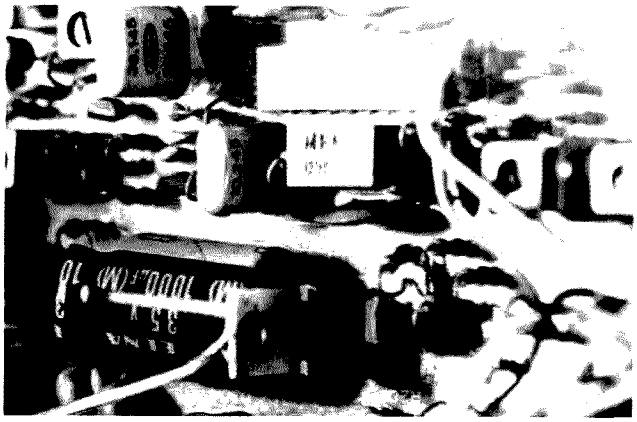


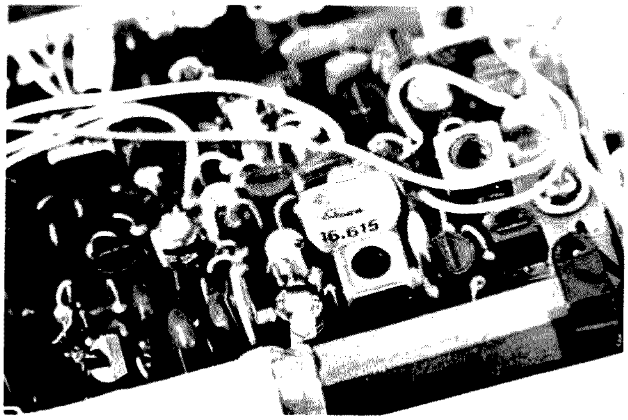
Fig. 1.

In case you want or need to change frequency on your wireless phone, here's some general information. The transmitting crystal in my hand-held is marked 16.615 MHz but is actually a third-overtone, 49.845-MHz crystal. Crystals can be ordered from Jan Crystals, PO Box 06017, Fort Myers FL 33906-6017. Be sure to tell them the name brand and model of your particular phone. It also would be a good idea to send along the original crystals to ensure that the new ones will be ground to the correct electrical characteristics.

The 49-MHz receiver at the base is a slightly differ-



Close-up of 49-MHz base-unit receiver crystals. The 39.145 crystal is socketed and can be changed easily.



16.615-MHz crystal in hand-held unit is actually a 48.845-MHz, third-overtone unit.

ent story. To receive 49.845 MHz, my unit uses a master crystal oscillator on 10.245 MHz to clack against a socketed 39.145-MHz crystal. This adds up to 49.390 MHz which is exactly 455 kHz (the i-f amp frequency) below 49.845 MHz. Other units may vary.

For the most privacy, you could change your wireless phone to operate on a frequency a smidgeon above or below the five designated 49-MHz channels and never have to worry about someone else with a similar unit making phone calls (either inadvertently or on purpose) through your base unit. However, to keep inside the law, it would probably be better to shift it to a frequency actually "between" the 15-kHz-spaced channels, keeping in mind to stay away from the vicinity of 49.860 MHz. A shift of 5 kHz is enough to keep you safe from similar units.

My hand-held had a crystal-controlled, 1700-kHz receiver. The HC32 crystal was 2.150 MHz which is 455 kHz above the 1695-kHz base-transmitter frequency. The base-transmitter frequency can easily be changed by adjusting a slug-tuned coil so you'll only need to change the receive crystal in the hand-held unit. Shifting the low-frequency link will also give you more privacy and less interference.

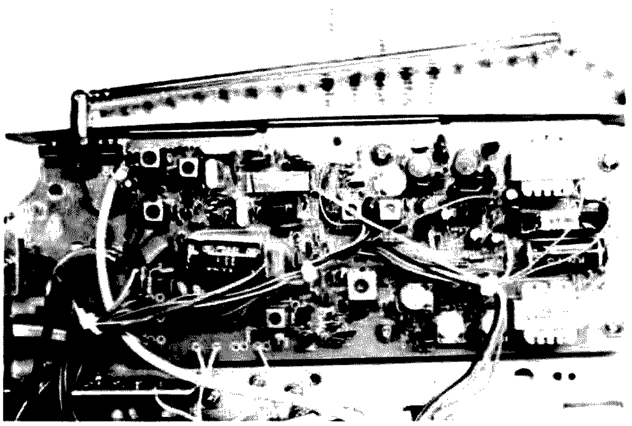
Now take a look at the power cord coming out of your base unit. One side of the zip cord is marked with a white line, small lettering, or a groove running the length of it. This is the "antenna" side of the 1700-kHz base transmitter. Keep this side plugged into the "hot" terminal of the electrical outlet for better phone range. In my case, it added about 100 feet of extra range.

Conversely, to increase the range of the 49-MHz base receiver, it can be connected to an outdoor antenna. I used a quarter-wave CB ground plane with half the radiator removed. A six-meter antenna would work fine and so would an allband scanner antenna, although these are more costly. You can use a clip lead connected between the base unit's telescoping antenna and the center of the external antenna's coax or open the base unit and solder a short length of shielded cable to the PC board and terminate it with the proper in-line female connector. Using an external antenna is all the more reason to shift the 49-MHz link to prevent unauthorized use of your phone line through the base unit.

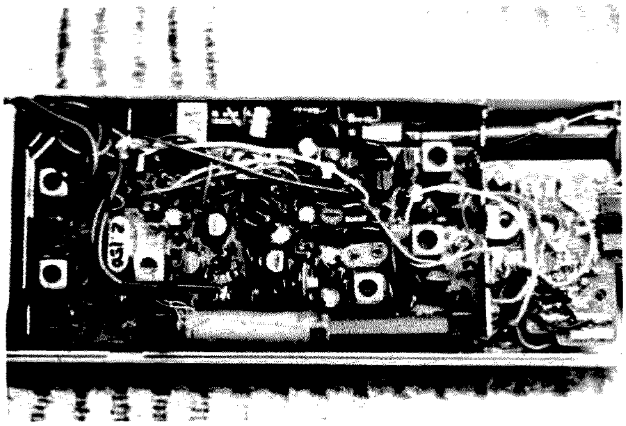
By the way, you can listen to the 1700-kHz side of the conversation on most broadcast-band AM radios if they have a bit of over-tuning on the high end of the dial. I've monitored my own base unit on two different hi-fi receivers successfully and have heard a couple of other neighborhood phones as well. You can hear both sides of the phone conversation on these frequencies. Just remember, the signals are FM so you'll have to use slope detection by tuning a bit to either side of the FM carrier.

I turned my base unit into a 49-MHz receiver by soldering a cable to the circuit board and running it to the input of an Archer 277-1008 amplifier sold by Radio Shack. There are four terminals on the circuit board connecting to the phone lines. To find the correct two terminals, first disconnect the base unit from the phone lines. Put the hand-held on "talk" so it is transmitting on 49 MHz. Using two clip leads, experimentally hook up two terminals at a time to the input of any audio amplifier until you get a loud squeal from the feedback between the hand-held and the audio amplifier. Once you've found the correct terminals, install the circuit in Fig. 1 between the base unit and audio amplifier. This prevents any loading on the phone line when you plug the base unit back in. It also allows you to listen in on any phone call using the audio amplifier. Now when you have the base unit on but disconnected from the phone line, it is a 49-MHz receiver for one of the five channels.

I also tapped into the base unit's regulated power supply to power the audio amplifier. It provides about



PC board in base unit. The 1700-kHz transmitter frequency can be varied by a slug-tuned coil.



PC board in hand-held unit. On the left of the board is the 1700-kHz receiver crystal, marked 2.150 MHz. In the middle is the 49-MHz crystal socket.

10 volts. The collector of the regulator power transistor (the "tab") and one side of the filter capacitor provide the power. Use a voltmeter to find the correct polarity. I added a jack to the amplifier speaker's battery terminals for quick connecting to the base's power supply. There's not much to it.

The wireless phones are quite nice to have when you aren't near a "real" phone. The only other suggestion to purposely curtail reception by others on the 49-MHz end is to keep the telescoping antenna on the hand-held extended just enough for clear communications—usually, you won't need to extend it at all when you use the unit in the house. ■

Modern-Eyes the S-Meter

Here's how to de-strain your baby blues by adding a simple LED readout.

Gordon W. Patterson
12-4215 Meadowvale Drive
Niagara Falls, Ontario
Canada L2E 5W8

Photos by Tish Cox

Having recently acquired a Realistic Patrolman 6 salvaged from the neighborhood garbage can, I decided that some form of indication was needed when I was tuned to the local repeater, VE3NRS. The only thing missing from the receiver was a band-selector shaft. This was easy enough to fix, and the receiver works great! I also use the receiver to listen to a local net which meets on 144.6 AM every Sunday night at 0230.

Various magazines were searched for an S-meter circuit; those found were unappealing. Then one day I stumbled across an LM3914 IC and my troubles were over. The LM3914 chip is a monolithic IC which senses analog voltage levels and drives up to ten LEDs, providing a linear analog display. This IC requires no resistors between the IC and the display, as the current drive to the display (LEDs) is regulated and programmable. The display can be used as either a bar or dot array. Another option of the LM3914 is operation from as little as 3 volts to a maximum of 18 volts. The IC can drive LEDs of many colors.

Theory of Operation

In operation, the device senses changes in the voltage applied to its input. The unit I built has an input range from 0.13 to 1.3 volts. So with each increase of .13 volts, the IC will turn on an LED in sequence.

Referring to Fig. 1, R1 controls the current going to the LEDs. With a value of 1000 Ohms, current through R1 will be 1/10 LED current, which gives a value of about 10 mA for LED current.

Take a look at Fig. 2. This is the internal operation of the LM3914. The 1.2 reference voltage is used for comparison of the voltage which is applied to the input. With each increase of .13 volts of the input signal, a resulting comparator will turn on and produce an output at pin 1 and pins 10 to 18 which will drive an LED. The LM3914 could be replaced with a handful of LM339s, but it would seem senseless since cost would rise and there would be more work required in constructing the circuit. Also, more discrete components would be needed.

In Fig. 1, you will notice that the display can be placed in the bar mode by connecting pin 9 to the Vcc

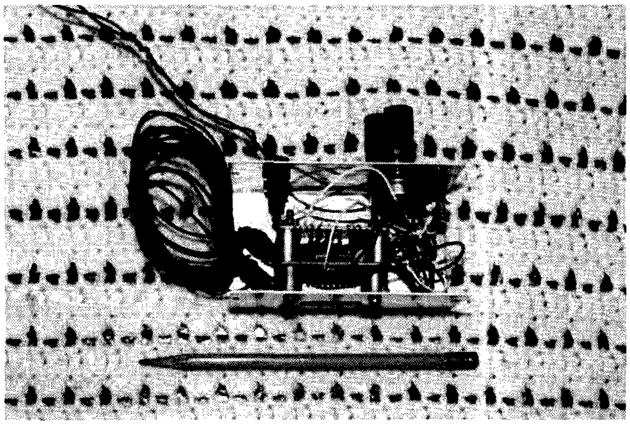


Photo A. The S-meter—inside view.

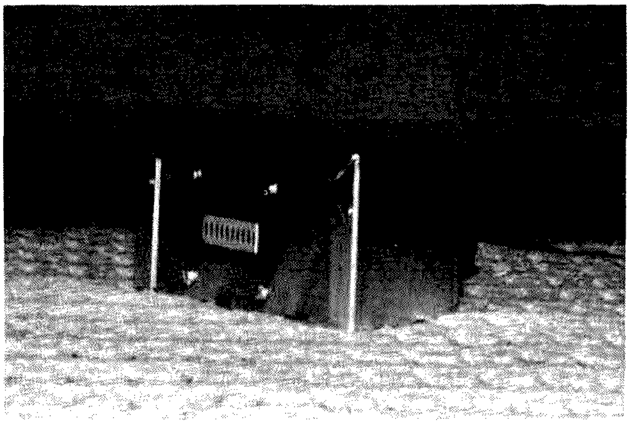


Photo B. The S-meter—outside view.

line, or in the dot mode by connecting pin 9 to pin 11. The 2.2-uF capacitor between pin 2 and the LED anode line is added only if the display flickers during operation.

Construction

The circuit was constructed on a PC board made by Radio Shack. The board was cut in half so that the LM3914 could be mounted behind the LED display using standoffs. The LED display I used was an MV57164 also purchased at the local Radio Shack. If you want to save money, you can use ten individual LEDs. Also, I recommend using DIP sockets for the display and the IC.

The entire project was placed in a 4″×2¼″×2¼″ chassis box since there was no room on the front panel of the receiver to mount the display. If you mount the display in a box, you will have to file a rectangular hole to accommodate the display.

I used banana jacks and plugs for the input, bar-dot display, and power connections. I mounted all of the latter on the back of the chassis box, including the calibration pot. However, you can select whatever you think is better. I used ½-inch spacers which brought the display to mesh nicely with the chassis.

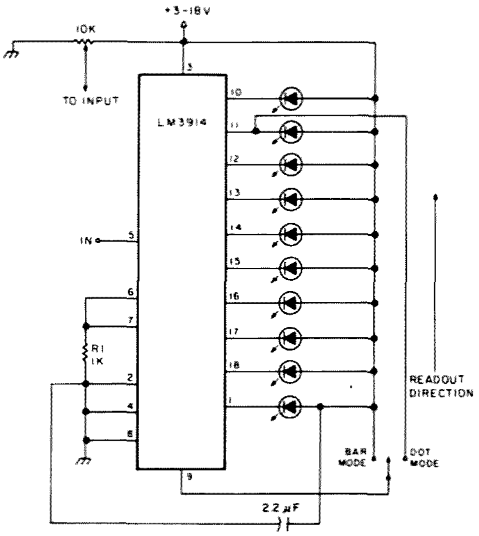


Fig. 1. Schematic.

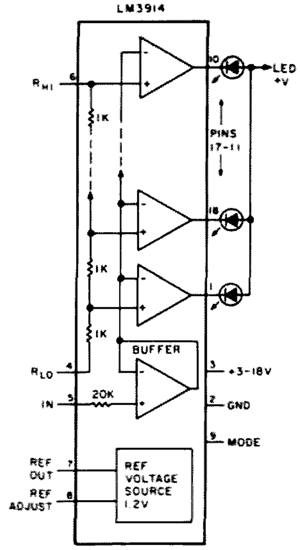


Fig. 2. Circuit of the LM3914.

Hookup

Once the project is finished, the only external connections needed are power and the input connection to the receiver's discriminator circuit. The power can be supplied from the receiver. Once this is accomplished, apply power to the unit. The display will be either on or off.

Now turn the receiver off but keep the supply to the project on. Adjust R2 until the first LED lights, and then back off on the pot until the LED goes off. Now apply power to the receiver and watch the display. Tune around the band a bit to see the reaction of the display. If you can't get the display to light, check to see that you have it in the circuit properly.

Conclusion

I've included a couple of photos of the completed unit so you can see what the device looks like. No longer do I have to tune by ear when I listen to the local repeaters. I'm already in the process of building another "Modern S-Meter" for an old, somewhat tired DX-160.

So heat up them soldering irons! ■

Parts List

Part	Description	Price
IC1	LM3915	$ 5.99
MV57164	LED display	5.99
R1	1k, ½-W resistor	.05
R2	10k pot	1.00
C1	2.2-uF, 25-V electrolytic cap	.50
A1	18-pin DIP socket	1.19
A2	20-pin DIP socket	1.29
PCB	Printed circuit board	2.29
	8 ½-inch spacers, @ .05	.40
	5 banana jacks, @ .35	1.75
	8 nuts/bolts, ⅛ x 2 inch, @ .05	.40
		$20.85

All of the parts are listed with Canadian price, and can be purchased from Radio Shack.

✓ See List of Advertisers on page 98

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Let's Have More Hams

Part I: How to organize and run a Novice class.

Every amateur-radio club attempts, or at least should attempt, a Novice class. Many of these classes wind up in a shambles very soon, however, as attrition reduces them to a small number of hardy hangers-on.

"Oh well," you say, "it's just separating the men from the boys, right?"

Wrong! You are throwing away many potential hams who wanted to get their licenses. They would not have taken the time to show up in the first place if they were not interested. That screening process has already been done for you, so there's no need to do it again.

So, what can be done to better organize and then run a Novice class which has the potential for graduating 100 percent of those who start? Plenty, and most of it has to be done before the first student walks in and stares at an instructor or a chalkboard.

Planning

Planning has to be done well in advance, and several questions have to be answered. What theory and regulations teaching system or syllabus will be used? Which method of teaching the Morse code will be utilized? Where will the class be taught? How often will the classes meet? Who will the instructors be? How will the class be publicized? These are the most important items, and this article will delve into each briefly.

Theory and Regulations

Any attempt to teach radio theory and regulations without an organized syllabus or teaching plan is doomed to disorganization. The plan must cover the entire subject matter and state exactly what must be taught on which day and in what order. Do not delude yourself into thinking that the FCC syllabus is sufficient. A student teacher in college presenting that document to his teaching supervisor would be laughed out into the hallway with detailed instructions about how much more work was required before he should show his face again.

Break down each class session into precise time periods during which certain matters will be taught. Fig. 1 shows a bare outline for one two-hour session.

1900-1910	Introductions, names, etc.
1910-1920	Questions and answers
1920-1940	Resistors and capacitors
1940-2000	Ohm's Law, E = IR, P = EI
2000-2010	Break
2010-2030	Morse code practice
2030-2045	Review of Ohm's Law, practical problems
2045-2100	Questions and answers

Fig. 1. Example of a basic teaching plan.

Each instructor should have an even more detailed guide, showing exactly what will be presented to the students, both orally and visually. Fig. 2 shows a good example of what an instructor's detailed lesson plan might look like for part of the section on Ohm's Law from the basic teaching plan shown in Fig. 1.

Use a chalkboard, overhead projector, slides, demonstrations, or whatever you have available. A visual presentation has far more impact on getting an abstract idea like voltage or current across to a wide-eyed bunch of students who have barely even heard of a resistor, let alone Ohm's Law.

There are several Novice teaching systems available, including those by Radio Shack and Heathkit®. The ARRL "Tune in the World" syllabus is a good, readily available course. It is complete and easy to use as a teaching guide, and it comes complete with a textbook. However, regardless of the syllabus used, be sure it is complete, comprehensive, and presented in a logical sequence. If Extra, Advanced, and old-timer Generals aren't sure if it is a logical sequence, take it down the street to your local junior high school science teacher. Remember, you are teaching people who are not hams and may never have seen a ham radio.

Morse Code

The requirement for learning the Morse code has driven off more potentially outstanding amateur-radio operators than any other barrier. While I am not personally convinced that the code is a valid requirement for a modern ham, it is nonetheless a legal requirement and must be taught. So, why not make it as painless as possible? Do not allow it to screen out scores of new hams before they have had a chance to get started.

After searching the market for Morse-code teaching methods, I have run across two distinct varieties. Both teach the code at five words per minute, initially. However, one teaches each character or letter at 5 wpm (slow style), while the other teaches them at 13 to 16 wpm (fast style). The slow style has characters going by painfully slowly, while the fast style zips them by briskly. The fast style leaves enough time between the characters to give an overall speed of 5 wpm. In my personal experience, there is no question about which is best. The fast style is far superior for learning the characters, and eliminates the necessity of relearning the characters at a higher speed later.

Among the fast styles, there are two subcategories of teaching methods. One of them teaches the letters by groups of dits (E, I, S, H, 5), then dahs (T, M, O, 0), then on to the other letters related in much the same way (ARRL's method). The other starts with A and N, then adds T and E, M and I, and so forth, teaching in groups based more or less on opposites (*73*'s method). I can see merits in both methods and have used them almost interchangeably. The key to the whole thing is teaching the characters at a high speed (13 to 16 wpm), gradually bringing the overall speed up once the characters are learned. Oh, yes. . . if you want them to copy a 5-wpm test without any trouble, teach the code up to about 7 wpm to allow for the jitters.

Now, how to test for code comprehension. Send a 5-minute typical QSO, complete with abbreviations, numbers, and punctuation, and see how they do. You can either give a written test, as does the FCC, or just see if they can get a solid minute's copy out of the whole thing. Be consistent and let them know what you expect from the beginning. You are the one who has to sign on the dotted line and guarantee to the FCC that the individual can communicate in the Morse code at 5 wpm.

One big problem nearly always encountered is a shortage of code-practice oscillators (CPOs). If the student doesn't get one in the first few weeks, he will have a hard time keeping up. The club can help out in several different ways. One is to have all those unused CPOs "donated to the cause" and give them to the prospective Novices. A better way is to have each student build one right away. Take part of the students' registration fee ($5.00 is more than enough) and buy the parts to make a simple oscillator. Club members can make up some PC boards ahead of time and provide the students with a few soldering irons and a couple of helping hands. By the end of the first session, each one will have his/her own private CPO. Another quicker alternative is to buy up a bunch of Radio Shack's code oscillator modules (cat. #20-1155) for about $3.30 each. These modules will require the addition of a speaker, a battery, and a key.

Another inexpensive and easy-to-build code-practice oscillator is shown in Fig. 3. This project should be easily within the capability of the club to help the new student build. One would need to add some sort of mounting for the components, probably a small PC board, wire, a flexible two-strand cable to connect the key, a couple of screws to hold the speaker, as well as any miscellaneous items the builder would want to add. The tone isn't the best, but it is adequate. Probably some variation of the resistors could improve things.

This does not include the key. Radio Shack has a pretty decent one for $5.95. The circuit draws about 30 mA at 9 volts with the key down. A 9-volt battery should provide several hours of code practice. The current could probably be reduced some by substituting a 1-uF capacitor in the speaker lead. (I didn't have one.) The circuit draws no current when the key is open, so there is no need for a power switch.

Ohm's Law, E = IR
E = electromotive force measured in volts
I = current measured in Amperes
R = resistance measured in Ohms
Draw basic circuit diagram on board
Show relationship between variables when one is changed
Do some formula solutions
Example: Voltage = 12 V
Resistance = 2 Ohms
What is current? Answer: 6 Amps

Fig. 2. Sample instructor teaching guide.

Instructors

During my early Naval training at Officer Candidate School in Newport, Rhode Island, I remember one particular leadership lecture. The school had brought in an old captain, whose name I have since forgotten, to talk to us about the mysteries of command and leadership. I remember very little of what he said, except for three rules:

Know your stuff.
Take care of your men.
Be a man.

These three rules, which I am sure he borrowed from someone else, summarize a lot of things about what an instructor should be.

Know your stuff. Choose an instructor who is very well versed in the material which is to be taught. Even a six-year-old will see right through a faker within five minutes.

Take care of your men. The instructor needs to be constantly in touch with how well the students are grasping the subject matter. Be demanding but personable—never be reluctant to drop back and teach it all over again with a smile if it did not work the first time. If at all possible, use a different approach. If they didn't understand, it is quite possible that the technique was faulty or the examples didn't make sense.

Be a man. Do not pretend to be Mr. or Ms. Know-it-all. If you do not know the answer to a question, admit it right off and make a note to bring the answer back next class period. The students will not think any less of you if you do not know one or two things. Also, have the moral conviction to stand up for some standards in what you expect of the students to pass the course. Do not let someone get by with what you know very well to be poor ability in Morse code, just because you are afraid to tell him that he has to work harder or do it again.

Teacher-student ratio. Limit the classes to ten or twelve students for each instructor. By keeping the teacher-student ratio down, each teacher can be personally involved with the students' progress.

Class frequency. In many cases, how often the class can meet will depend on how often the classroom is available. Barring this restriction, however, twice a week is best. Once a week can be made to work, but the time between sessions makes the classes almost unrelated. If classes meet more *often* than twice a week, students (as well as instructors) will start dropping out from time starvation. Remember, ham radio is *not* the only thing in the world.

Publicity. If no one knows that you are going to have a class, it is hard to gather a crowd. Assign one person (the club's public-relations chairman) to get the word out. Draw up some flyers and get them put up around town. Be sure they get to the junior and senior high schools. If one of the club members works for the local school district, tap him to be the special agent for getting those youngsters notified. They are the best potential hams going because of their unbridled enthusiasm. Most of these kids play around with computers routinely, so electronics is nothing new, and the idea of communicating fascinates them.

Get a spot on the public-service announcements of your local TV and radio stations. Don't just drop off a note and leave; get ahold of news reporters and bend their ears for a while. Tell them they can film the class for a personal-interest story.

Then, don't forget to look for prospective students in your own backyard: wives, husbands, sons, daughters, friends at work, next-door neighbors. All of these people have probably been introduced to ham radio by knowing you. Heck, offer to pay half their registration fee with the other half kicked back if they pass the test. (I hope you're not in this game for the money.)

Miscellaneous Planning Considerations. Choose one individual to be the Novice-training coordinator. Then choose a second person to be the Morse-code instructor. Once this is done, you have gone a long way toward ensuring consistency of instruction. The training coordinator must ensure that continuity is maintained between different instructors. The Morse-code instructor will ensure that the students aren't confused by a myriad of different pet methods of learning code. It's hard enough for the students to learn the code without having to fight their way through several different instructors' ideas about how it ought to be done.

For each student, assign a club member to be his "Elmer." This individual should be present at the first session, and then he should regularly contact the student throughout the progress of the class. This personal touch is essential to maintain interest, especially when initial frustrations are encountered. It also helps when the time comes to set up the first Novice station, or to answer the frantic telephone call at 9:00 pm concerning the unexplained interference to channel 3. *Get your Elmers out.*

The First Class Session

The basic rule for the first class session is to relax the students and introduce them to amateur radio pleasantly. Set up a demonstration of 2m FM, HF CW, and SSB, and throw in some RTTY or ASCII and even some SSTV if it's available. Have the gear set up and tested well in advance with club members planted out in the community for guaranteed contacts.

Make introductions quickly. Pair students off with their Elmers, talk about ham radio a lot, discuss how the course will be run, and build that code-practice oscillator. End it all with the demonstration, letting the students get on the air a bit.

I watched the glazed eyes of several students after they walked out of a first session in which they had been hit with E = IR, P = IE, 468/f(MHz), and a list of the Novice operating frequencies. They had little idea of what they had been given, and they felt they were already in over their heads.

So, bring them in gently, then begin talking about the more substantive material in session number two. By then, they have had a chance to talk to their Elmers, get in a bit of code practice, read the text book, and raise a few good questions. Things will be off to a better start with much less early attrition.

Keeping It All Flowing

Once the initial excitement has died away, it is down to the work of teaching and testing. If you have more than one instructor, the class coordinator must constantly be sure that the teaching is consistent between classes. Keep track of each section's progress. If one student seems to be dropping behind, get the assigned Elmer onto the case right away. The Morse-code instructor should be sure that all practice is done consistently and should check each student every class period. Tests should be available every class session for anyone feeling he is ready. Emphasize the importance of getting that code out of the way first.

Wrapping It All Up

At some point, all the material will have been taught, and everyone will have been given an opportunity to learn the code.

Those who have not passed the code by the end of the program need to have special attention. In most cases, these people are the "Nervous-Nelly" types, who get the jitters each time they take a test, or who have convinced themselves that it is all too hard. With these people you have to pull out all the psychological stops. Be sure these people get with their assigned Elmers. Keep encouraging them. Above all, keep them with other hams and try to maintain their interest.

You will lose some, perhaps, but don't let it happen because you just let them slip away, frustrated. Stay in touch with them, and let them know that it is always possible to try again. It is often easier the second time around.

If you publicize well, and in the right places, the people will respond. Then, by managing the resources available to the local club and by spending a lot of preliminary time in planning and organizing, you can graduate most anyone who sincerely tries. Let's get some more good hams into our community. They are out there just waiting for you to give them a chance. ■

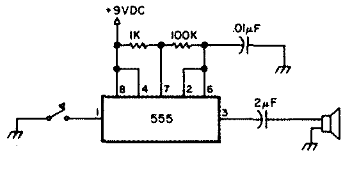


Fig. 3. Inexpensive code-practice oscillator.

CPO Parts List

555 timer	$ .34
1k	.05
100k	.05
.01 uF	.08
2 uF	.13
2" speaker	1.25
9-V battery	1.00
battery lead	.10
case	1.99
	(Radio Shack)
Total	$ 4.99

Thanks to WAØPBQ, my dad, for the circuit design and description.

Jim Burtoft KC3HW
RD 2, Box 131
Washington PA 15301

Let's Have More Hams

Part II: How to take and pass FCC exams.

Take it from me, upgrading your amateur license is a major task. Think about it. First there's the time spent studying, then there's the trip to the exam point (often far away), and finally there's the exam itself.

I know. I've recently returned from taking the Advanced exam. For me, the entire process was fun because I passed the first time. Unfortunately, for some in the room it wasn't fun. They failed. And for some it was their third time.

Despite all protests otherwise, the real reason applicants fail the exam is inadequate preparation. When you go for the written, you must know the material *thoroughly*.

This is going to be even more important in the future with the recent changes allowing volunteer examiners. You can be sure that the new exams will not be compromised easily. Some book publishers may find themselves out of business. The net result will be an increased emphasis on understanding and a reduced reliance on question memorization.

Surprisingly, most, if not all, study materials overlook one important phase of preparation—that of preparing your test-taking skills. Remember, the FCC determines your qualifications by administering a test. It's unfortunate but true that a person can know the material but still miss questions because of poor test-taking skills. My goal in this article is to improve your skills. A little time spent on brushing up here could make the difference between passing and failing.

The First Mistake

Mistake number one usually comes long before the applicant walks through the examination-room door. Sometime after he begins studying for his first license, the ham-to-be learns that all FCC exams are multiple choice.

A feeling of pleasure and relief overcomes the neophyte. After all, he reasons, what could be easier? The answer's right there in front of me. All I have to do is pick it out.

This attitude toward a multiple-choice-type exam is the first mistake. Actually, a well-written multiple-choice exam is not the gift some think it to be. It can be one of the most difficult exams to bluff your way through. Multiple-choice questions are written to require a sound knowledge of the covered material. Let's look at Fig. 1, which is sample question number one, and use it as an illustration.

In the circuit shown, what is the value of R1?

A) 24.2Ω **C)** 4.8Ω
B) 120Ω **D)** 48Ω

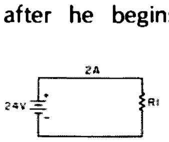


Fig. 1. Sample question one.

In order to answer this question, we have to know Ohm's Law. To get the answer, you must divide the voltage by the amperage. In this case, B is the correct answer: 120Ω.

If you're well grounded in this basic law, it's no problem. But what if you are weak on this point? What if all you could recall was that Ohms, volts, and Amps are interrelated and that you can get one by multiplying or dividing the others... somehow or another. If you multiply volts times Amps, you come up with 4.8Ω. This answer also is listed (C) as a possible choice. No amount of inductive reasoning can help you eliminate a wrong answer like this. You must *know* the material.

The Role of the "Good-Looking" Wrong Answer

FCC exams have often been maligned as being unfair, tricky, or as not really testing your knowledge. Actually, it's not so. The charges stem from the use of the "good-looking wrong answer" in a multiple-choice test. Look back at question one again.

The purpose of this question is to test the applicant's ability to use Ohm's Law to solve basic dc calculations. Therefore, all the answers can be derived by adding, multiplying, or dividing the other numbers in the problem.

What is the simplest form of an amplitude modulation detector circuit?

A) Transistor detector
B) Balanced detector
C) Diode detector
D) Diode series demodulator
E) Diode rectifier

Fig. 2. Sample question two.

How much testing can occur if the wrong answer choices are listed in kHz, pF, or mA instead of Ohms? Very little, of course. If the wrong answer choices are listed in anything but Ohms, the purpose of the question is defeated.

In order to test the applicant's ability effectively, the wrong answer choices must be similar in form and content to the right answer. In the process of keeping the wrong answers from being obvious, the exam writers create the good-looking wrong answer. These answers are designed to be equally as appealing as the right answer. For the individual with a poor grasp of the material who is just guessing, it can be extremely difficult to differentiate the right answer from a good-looking wrong answer.

Exam writers create good-looking wrong answers by taking a basically correct answer and modifying it with a misconception. Here's an important point for you to remember as you're taking your exam. When you're considering the various choices, don't be looking for truth in the answer, *be looking for error*!

All answers will have some semblance of truth in them. Only one will contain no error. The amount of error incorporated in the test answers determines the difficulty of the test. The less error, the more difficult it is to distinguish the right answer from the wrong one.

Let's look at question two in Fig. 2 and use it as an example. Question two is a definition question. The correct answer is C: diode detector. Now look at all the incorrect answers. The words "diode" and "detector" are sprinkled through the wrong answers. They are the truth part. The balance makes up the error part.

It takes a thorough knowledge of the material to answer the question. If all you can remember is that it's "some type of detector" or "it had a diode in it," your chance of guessing correctly will be minimal.

Now that you're aware of these good-looking wrong answers, be careful to stay clear of them on your exam. Don't jump at the first answer that looks appealing. Look at it closely. Remember, you're looking for error, not *truth*.

The Multiple Types of Multiple Choice

Although the whole exam is multiple choice, all the questions won't have the same format. In fact, they break down into three distinct types with a different technique needed to correctly answer each type. Let's look at each of them. My goal is to give you a practical technique for getting what you do know down on paper in the form of a correct answer.

Problem questions. The first kind is the problem question. Question one is an example of this kind. This question provides some information about the circuit and then, based upon this information, asks you to determine the value of some other portion of the circuit. To be able to answer this question, you must be familiar with electronic formulas.

The most important step in correctly answering this type of question is to keep your eyes off the answers. I strongly advise that you cover them with a sheet of the scratch paper provided with the exam. The choices that the exam offers are irrelevant at this point and will bias your thinking if you read them.

Having covered up the answers, read the question carefully. Note all the information given. Your answer must be based on this information alone. Don't read anything into it.

Next, determine what steps you're going to use to arrive at the answer. In question number one you could say to yourself, "I'm going to divide the voltage by the amperage to get the resistance."

Usually the questions are not this easy. You'll find yourself having to do two or three intermediate steps to arrive at the final answer. In the longer problems, this technique really pays off. If you think the problem through in advance, you are less likely to stop short of the final answer or become confused.

The final preparatory step is to decide what is the correct unit of measure for your answer. Is it Ohms, volts, uH, or pF? Determining this now can help you avoid some of those good-looking wrong answers. It's common to find the result of some *intermediate step* listed among the answers. Don't get caught.

While all this seems time-consuming and unnecessary, it's neither. What you've done so far you would have done anyway. The advantage is that you are less likely to make an error if you do all the reasoning in a single step rather than piecemeal as you go. In addition, knowing what you're doing tends to take off some of the pressure. As you relax, you'll probably do better work.

Now start your work by writing down your formula in its symbolic form. It doesn't matter if it's as simple as Ohm's Law. Write it down.

Right now I can hear someone saying, "Hrump! That's dumb. I'll bet Extra-class hams don't write down formulas!"

Well, maybe they do and maybe they don't, but you aren't an Extra (yet). Frankly, it doesn't matter if you ever write one down again after the exam. It is important that you get the right answer this time, and writing it down reduces the possibility of skipping steps in the procedure.

Besides, if you goof, everything's written down on paper in logical order so that you can recheck your work.

Once you've arrived at your final answer (making sure that it's in the same unit of measure that you determined beforehand), uncover the test answers and compare your answer to those listed.

Just a personal observation here: I've rarely arrived at the exact same answer as was listed in an FCC exam. The difference probably lies in where we rounded off very large numbers. Your answer should be close, however. Pick the one closest to yours if you're satisfied you've made no mistakes in your *calculations*.

Does this sound like a lot of work? Actually, it's no more than you would do any other way. What you have done is to force yourself to think your way through the problem first, then to solve it by following a pattern of logical steps, and finally to avoid letting miscues from those good-looking wrong answers bias your reasoning.

Definition questions. The second kind of question that you'll encounter is the definition question. It's just what it sounds like. You must choose a word or phrase from the list of answers that the definition in the ques-

A low-pass filter attenuates—

A) —all frequencies below its cutoff.
B) —all frequencies above and below its bandpass.
C) —all frequencies in its bandpass.
D) —all frequencies above its cutoff.

Fig. 3. Sample question three.

A low-pass filter attenuates—

F **A) —all frequencies below its cutoff.**
F **B) —all frequencies above and below its bandpass.**
F **C) —all frequencies in its bandpass.**
T **D) —all frequencies above its cutoff.**

Fig. 4. Another look at question three.

tion best describes. Question two in Fig. 2 is our example.

Our number one rule here is the same as with the problem question: Don't look at the answers. Cover them with a sheet of scratch paper. They're irrelevant and can only tend to bias your thinking.

Now, with your answers covered, read the definition carefully. While reading, pay close attention to any limiting words such as "only," "all," "most," "always," etc. These words can affect the answer to the question. Make sure you've noted them when forming your answer.

Having read the question, decide (still without looking at the test answers) what *you* believe the answer to be. Now you may uncover the exam answers. Your answer will probably be on the list. If not, there will be one that you recognize as meaning the same. You've found your answer.

Again you have gone through a thought procedure that has forced you to arrive at the answer on your own. The definition-type question is where you are most susceptible to the good-looking wrong answer.

Statement questions. The final kind of question is the statement question. This question differs substantially from the two kinds discussed above. Let's look at question number three in Fig. 3 and explain it.

Question three is composed of the beginning of a statement. Each of the answers forms a completion to the statement. You will be asked which one of the possible answers makes a true statement when coupled to the question. Part of the information needed to answer the question is located in the answer portion, so in this case you must become involved with the exam answers before forming your own answer.

Be cautious, because it's extremely easy to draw a wrong conclusion based on something contained in one of the good-looking wrong answers. As you look at your possible answers, you will find that most of them sound reasonable.

Remember what we said about the good-looking wrong answers being a basically true statement with some degree of error included. The answer that you're looking for here is the *only* one that makes a *completely* true statement coupled with the question. Therefore, you should be looking for *errors in reasoning.*

The best way to handle this question is to treat it as a multi-part True and False question. Look at the same question in Fig. 4. In this illustration we take the question and mentally couple it to answer A; because answer A when connected to the question makes a false statement, we have penciled an F in front of it. The same process is used as we determine that B and C are incorrect. Answer D when connected to the question forms a true statement. D, then, is the right answer.

You are more likely to get the question right if you treat each answer as a separate True-False statement and look for errors in reasoning.

Statement questions can take several forms. Some may have no information in the question. They may simply ask, "Which of the following statements is correct?" This is still a statement question and is answered using the same technique.

Statement questions may also take a negative form. You may be asked, "Which of the following is *not* true?" Special care must be taken to see that you remember that you're looking for the one statement with error. Under the pressure of the exam, it's easy to forget that the question is reversed and panic when you find two statements that are absolutely true.

What To Do When You're Not Sure

It would be wonderful if you had prepared yourself so thoroughly that you knew the correct answer to every question. That's not realistic, though. There are always the tough ones.

Let's review a couple of suggestions that might help when the going gets tough.

First, there's the old standby—skipping and coming back to it later. Usually the applicant hopes that there will be something in one of the later questions to help him answer the one he's stuck on.

This suggestion is highly overrated. Exam writers are on the lookout to ensure that information from one question doesn't answer another. The best that you can reasonably expect is to come back to the original question in a different frame of mind.

Another method of finding an answer to an otherwise impossible question is to rearrange the words in the question. Look at Fig. 1 again.

If you can't remember how to find resistance, perhaps you can remember how to find amperage. With the information given, we can rearrange the question so that we can solve for amperage. Which of the possible answers, when divided by the voltage, gives .2 Amps? Answer B is the only one.

You can do something similar with definition and statement questions. To use this system, look at each of the answers and recall everything that you can about it. Your goal is to eliminate answer choices for which you can recall some other function or characteristic.

Look at Fig. 2 again. Let's assume that you couldn't decide between answers C and E. Perhaps you were unsure because you knew that both were tied in with changing ac to dc. By reviewing everything you can on both subjects, just perhaps you'll recall that diode rectifiers are used in power supplies. Since you can think of another application for diode rectifiers (answer D) but can't think of another use for diode detectors (answer C), then diode detectors is your best choice.

I'm offering no guarantees; nothing is going to give you the answer when you don't know enough. The hope is that one or another of these suggestions may shake something out of the old brain box that you aren't aware is there.

The Follow-Through

You're finished with the exam but not with the chance for a mistake. Like everyone before you, there are probably one or more questions that you're not too sure about. What should you do?

Changing answers is a counterproductive activity.

Here's a hard and fast rule: Don't change your answers unless you either find an error in your calculation or you recall a specific piece of information that makes you realize an answer is wrong. Don't change your answer because you're having second thoughts. Your first impression is usually your best. Leave it alone.

There's one last thing that you should do before turning in your exam. Take a few seconds to relax from the tension of the exam and then go back over your answer sheet. This time you're looking for errors on your answer sheet. Look at each question and then the answer that you put down on your sheet. Is it the answer that you intend to have there? Under the pressure of the exam, you could easily have marked the wrong answer slot on the sheet. Now's the time to check the sheet and correct any mistakes.

The last step? Turn in your sheet and wait for the result. If you've followed the suggestions given here, your exam will be a true reflection of what you know—and that's what it should be.

A Word About Preparation

As I've said before, the key to passing an FCC exam is preparation. You absolutely must know the material. Think about it for a moment. How much real studying have you done? I don't mean reading the Q & A manuals, I mean real honest-to-goodness studying.

Before you waste time and effort taking the exam, consider spending some time, effort, and money on a formal course of study. Not only will it help you get through the exam, it will also make ham radio more interesting.

73, and I hope to hear you on the bands with an "interim" attached to your call! ■

Steve Finberg W1GSL
PO Box 82, MIT Br.
Cambridge MA 02139

Son of Nicad Conditioner

This intelligent discharger knows when to stop and tells you how much time it took.

I found the "Nicad Conditioner" article by W2KPE (*73*, April, 1981) quite interesting, having previously constructed a similar device. The nicad conditioner discharges a battery pack each time before then recharging it.

I recently needed to construct another for the local security force which was interested in cycling its batteries. Since they already had a battery charger set up to "rapid-charge" batteries, I decided to build only W2KPE's simple discharger (shown in his Fig. 1, reproduced here). Several problems immediately developed with his simple circuit. First, it would not stop the discharge at the desired cut-off voltage; it just turned into a buzzer. And if the battery was accidentally connected backward, the control transistor burned out instantly. My improved circuit corrects these problems and adds a simple timer to make life-testing of batteries much easier.

First, some background for those who may not have read the earlier article. The nicad batteries commonly used in hand-held transceivers have one undesirable characteristic: memory. They tend to remember the way in which they have been used. If they have been used only lightly, or not at all, any attempt to heavily and fully discharge them will result in a quick discharge—much quicker than their Amp-hour rating would suggest. (See Fig. 2.) This is especially true if they have been continuously charged without use for a long period. It has been shown that completely charging and discharging the battery several times (cycling) will erase the memory and restore full capacity.

A single nicad cell may be safely and fully discharged by merely placing a suitable load resistor across it (Fig. 3) and waiting for the voltage to go to zero. This, however, is not suitable for discharging nicad battery packs. If we let the nicad pack discharge to zero, a very dangerous phenomenon can occur. Some of the cells in the pack will discharge to zero before the others, due to mismatch of cell capacities. The cells which reach zero volts first will still have current being forced through them by the others. This will tend to reverse-charge (change the polarity of) these cells. Once a nicad is reverse-charged, it is very likely to short out. If a single cell in a pack shorts out, it will no longer take any charge and can only be rescued by heroic measures.*

To reduce the possibility of reversing any cells, it is good practice to halt the discharge of a nicad pack when its voltage drops to just less

*"Zapping Dead Nicads to Life," K2OAW, *73*, January, 1976.

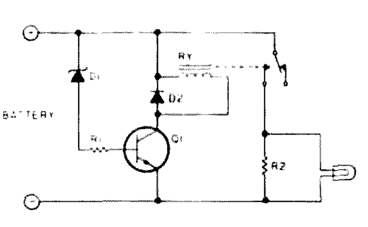


Fig. 1. K2KPE's conditioner/discharger circuit.

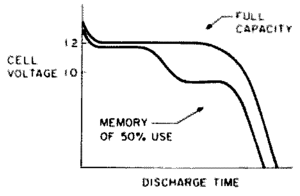


Fig. 2. Nicad discharge characteristics. Note early drop associated with memory.

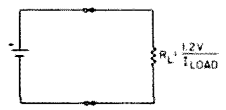


Fig. 3. Single-cell discharger.

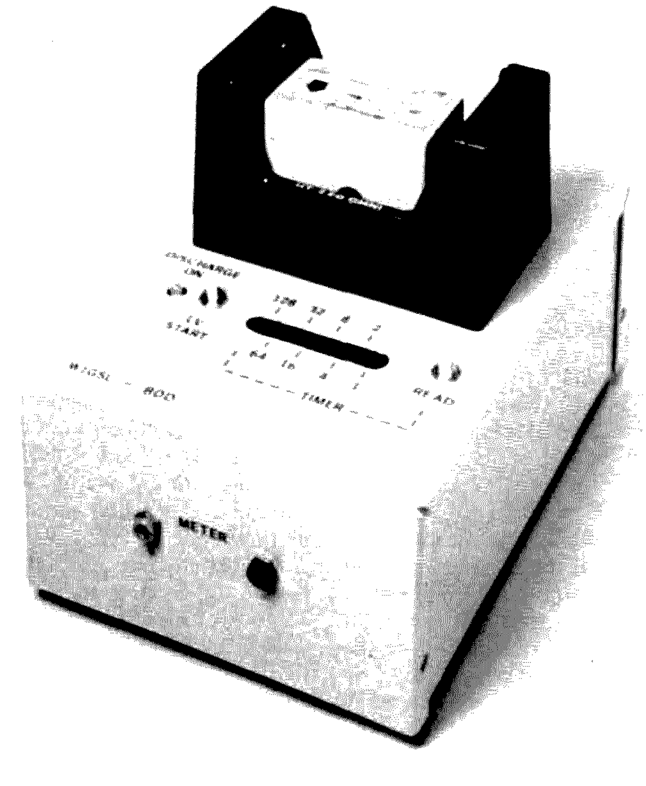


Photo A. The mounting of the discharger is not critical. This version was built into a 3" × 5" × 7" mini box.

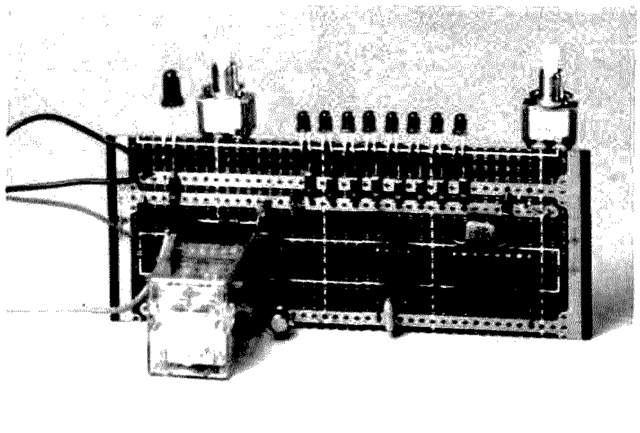


Photo B. The discharger and CMOS timer are built on a piece of IC perfboard.

than 1 volt per cell (10 to 12 V for a 12-cell, 15-volt battery pack).

W2KPE's final circuit, with a latch to start the charger, probably worked just fine. However, his basic circuit has two problems:

1) When the battery reaches the point of discharge ($V_{bat} = V_z + .7$ volts), the relay opens and removes the load. The battery voltage increases when the load is removed, causing the relay to pull in, loading the battery, and the cycle repeats rapidly. This makes a good buzzer to tell you the battery is discharged! However, it leads to a serious life problem for the relay, and I prefer to use an LED as an indicator to minimize noise pollution.

2) If the battery is connected backward, virtually the entire battery voltage is placed across Q1's base-emitter junction. Unfortunately, the breakdown voltage of most transistor base-emitter junctions is less than 6 volts. Once the junction breaks down, there is nothing to limit the current flow and the transistor burns out.

In my improved circuit (Fig. 4), the discharge cycle is started via zener 1. Z1's voltage was chosen so that the discharger will start automatically only with a good, fully-charged battery. Once the relay pulls in, zener 2 is connected. The battery will continue discharging until its voltage drops to less than V_{Z2} + 2.1 V. The series diode, D1, prevents polarity-reversal burnout. D3 keeps R2 from drawing current (through Z1 and Z2) with the relay open.

To use the discharger, first charge the battery in the normal way and then connect it to the discharger. If the discharge LED (D4) comes on, there are no shorted cells. If not, the battery has a shorted cell or may not have been fully recharged. S1 allows the discharge of low-voltage batteries to start. Once the discharge cycle is started, just sit back and wait for the LED to go out. The length of time that the LED stays on is proportional to the battery's capacity.

A discharge timer (Fig. 5) is a very useful addition. It allows a relative measurement of battery capacity without constant attention. The circuit measures the length of time it takes to discharge the battery. To use it, discharge the battery as above. Once the LED goes out, push the "read" button before removing the battery. The number of minutes it took to discharge is displayed in binary by LEDs D5 through D12.

The timer circuit is quite simple. IC1, a 555 timer, runs as a 1/64-minute oscillator whenever the relay is pulled in. Its output drives a 14-bit CMOS counter, IC2. The last 8 bits are displayed by LEDs D5 through D12. R6 and C2 act to reset the count to zero upon battery insertion. The CMOS counter is always connected to the battery. Its current drain is so low that it does not further discharge the battery once the relay opens. As long as the battery voltage remains above 3 volts, it will remember the discharge time. S2 connects the display LEDs only when a reading is desired, so that the battery will not discharge significantly after the relay opens.

I was only interested in relative discharge times, so the timing of a 555 was adequate. A crystal-controlled clock could be substituted if greater accuracy is needed.

Design

Select zener 1 so that V_{Z1} + 1.4 V is just less than the fully-charged battery voltage. Select zener 2 so that V_{Z2} + 2.1 V is your desired cutoff voltage (usually equal to 1 V per cell in the battery).

Zener Diodes

In selecting zener diodes, I ran into two problems:

1) They are made with fairly broad tolerances; usually I had to pick from several to get the exact voltage I wanted.

2) Above 10 volts, they are available only in fairly coarse steps.

Since the cutoff voltage is not critical, this caused no problem with Z2. However, I wanted to set the turn-on voltage fairly accurately. My solution was to stack 2 zeners in series for Z1 (see Fig. 6). The zener voltages effectively add. Because low-voltage zeners are available in finer steps, this made possible a more exact setting of the turn-on voltage.

I started with the existing Z2 (8.2 V) and placed a 5.6-volt Z1' in series, giving an equivalent V_{Z1} of 13.8 volts. This set the turn-on voltage at 15.2 volts.

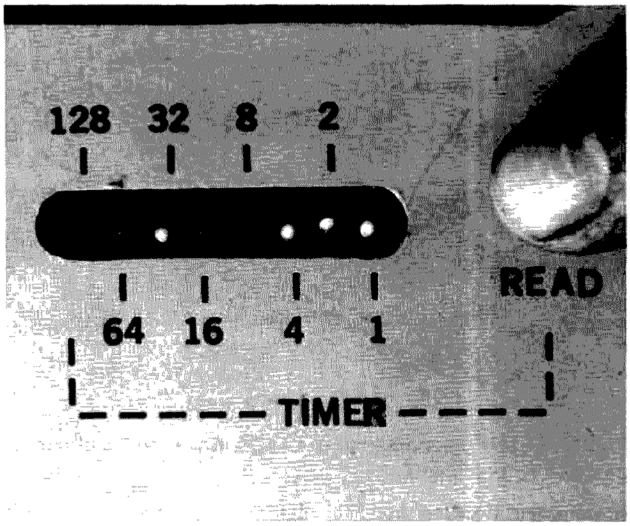


Photo C. Press the read button and see the discharge time in binary form. This battery has been discharging for 39 minutes (32 + 4 + 2 + 1).

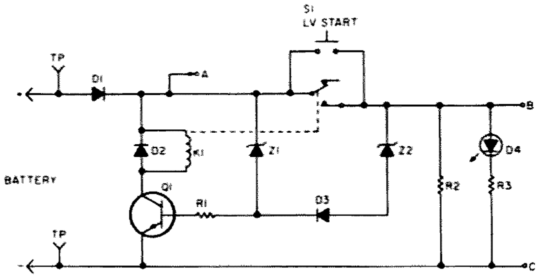


Fig. 4. Improved discharger with polarity protection and shorted-cell detection.

Zener Substitute

A crude but effective substitute for the zeners can be made with several series-connected forward-biased diodes. Eight series silicon diodes will work as a 5.6-volt "zener." Each additional diode raises the voltage by about .7 volts. Any small silicon diodes such as 1N914s will do. While series diodes take up much more room, they offer the advantage of easily setting the voltages with good resolution (.7 V), and at 10 for $1 (Radio Shack part no. 276-1122), they are cheaper and easier to get than standard zeners. The voltage drop across each diode is not very precise, so you may have to experiment to get the exact voltage you need.

The load resistor should draw about the same current as your transceiver does in transmit (R2 = V_{bat}/I_{trans}). R2 will get hot and must be a power resistor. If your load current is fairly low, you may want to include the 20 mA or so that the relay and indicator LED draw in the discharge calculation. Because the CMOS counter can only safely drive 3-mA loads directly, set LED current-limiting resistors R7 through R14 for 3 mA at full battery voltage.

The values in the parts list are what I used for Motorola 15-volt (12-cell), 450-mAh batteries discharged at 300 mA.

Construction

Nothing is particularly critical. I built my unit in an aluminum Bud box, with a sleeve from a charger mounted on top. All of the circuitry except the load resistor is mounted on a small piece of perfboard. The switches support the board and the LEDs are positioned to show through holes cut in the top. The load resistor gets moderately warm, so adequate ventilation should be provided.

An alternative to the CMOS timer is a standard electric clock. If a double-pole relay is substituted for K1, the second pole can control a 110-volt-ac outlet (Fig. 8). An ordinary electric

Parts List

Part	Description	Radio Shack part number	Price
C1	1-uF, 50-V (16-V)*	272-1419	$ .49
C2	.33-uF, 50-V (.47, 16-V)	272-1417	.49
D1, D2, D3	1N4001 silicon diode	276-1101	.75
D4	Jumbo red LED	276-041	.40
D5–D12	Mini red LED	276-026	3.16
IC1	NE555 timer	276-1723	.99
IC2	CD4020B CMOS counter	Active Elec.**	.63
K1	SPDT relay, 12-V, 1000-Ohm coil	275-003	2.99
Q1	2N2222 NPN transistor	276-1617	.20
R1	8.2k, 1/4-W (6.8k)	271-1333	.08
R2	50-Ohm, 25-W (10-W)	271-133	.45
R3	1.8k, 1/4-W	271-1324	.08
R4	1-meg, 1/4-W	271-1356	.08
R5	180k, 1/4-W (150k, 1/2-W)	271-047	.09
R6	100k, 1/4-W	271-1347	.08
R7–R14	5.1k, 1/4-W (4.7k)	271-1330	.63
S1, S2	SPST NO push-button	275-1547	1.00
Z1'	1N751 5.1-V zener (1N4733)	276-565	.45
Z2	1N756 8.2-V zener (see text)		
	Metal chassis (5.25" × 3" × 2")	270-238	2.49
	IC perfboard, 1.5" × 4" scrap	276-168 (2" × 3")	1.95
	Charger contact sleeve	Motorola***	
	for HT 220 "Omni" (I have often	P/N 15-84799H03	4.55
	found fully-assembled used	+ 2 04-84734H01	.18
	charger sleeves at ham flea	+ 2 39-05605A01	1.32
	markets for only $2–3.)	+ 2 14-82296E01	.80
		+ 2 41-82093A02	.53

* All of the parts I used were found in the depths of my junk box. I have listed the nearest equivalent Radio Shack parts where possible. Any difference between the part used and the (Radio Shack) part is noted with parentheses.

** Active Electronics, PO Box 8000, Westborough MA 01581.

*** Motorola C & E, 85 Harristown Rd., Glen Rock NJ 21076. For other radios, either contact manufacturer for charger replacement part or home-brew suitable contacts out of nails or sharpened screws and plastic.

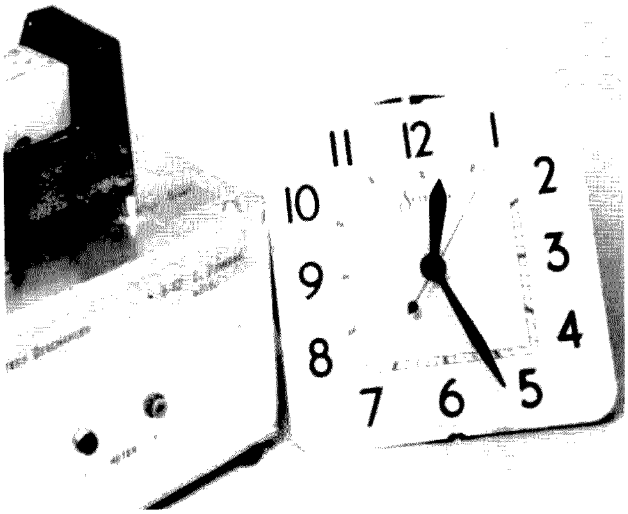


Photo D. If you don't like ICs, use an electric clock. This discharger uses the guts of an old kitchen clock as the timer.

clock can then display the elapsed time. While this is easier to build and read, the cost of the clock is higher, it would not reset itself, and it is not as portable.

A few words of caution: This device is very useful but it is not a panacea. Nicads can lose capacity for reasons other than memory, in which case cycling will not restore full capacity. One of the prime causes of early failure is overly-rapid charging, leading to overheating and electrolyte discharge. Once a cell's seal has been broken and the internal electrolyte vented, there is no way to restore lost capacity. For this reason, unless you are very confident that your "rapid charger" can limit any temperature rise, I would never recommend charging any faster than at a .1-C rate. This means that the charge current is set to one tenth the milliampere-hour capacity (C) of the battery. For my 450-mAh batteries, this requires a charge current of 45 mA. It takes about 16 hours to fully recharge a battery at this rate. Most manufacturers claim their cells can withstand this charge rate indefinitely without failure.

Nicads have a finite life of only several thousand discharge cycles. Since each full cycle by the discharger represents one of them, it seems best not to allow your battery to develop a memory by fully using it (transmitting) rather than cycling it. Unfortunately, many hams' lifestyles don't permit this. The radio sits in the charger till the weekend, or maybe they prefer to listen most of the time. In these cases, occasionally cycling the battery makes sense, especially before big events when you will need longer-than-usual service.

In summary, nicad batteries need occasional cycling to remove memory effects. Care must be taken in discharging nicad batteries to prevent cell-reversal damage. An improved discharge device is presented for use by those who already have a suitable charger. The improved discharger can detect the presence of shorted cells, is not subject to reverse-voltage burnout, and is silent in operation. A timer has been added to aid in judging battery capacity.

Over the last several years, this battery discharge device and its predecessor have kept my batteries up to snuff and enabled me to salvage several perfectly good battery packs from the reject piles of local commercial users. ■

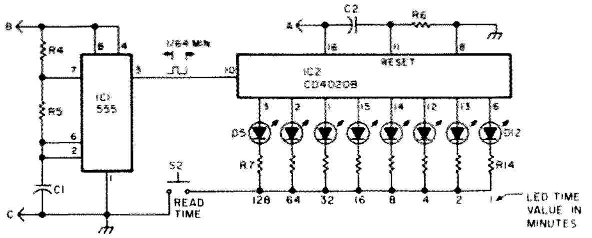


Fig. 5. Discharge timer. Each lit LED represents a fixed time since the discharge started. Add all the illuminated times to get the total time of discharge.

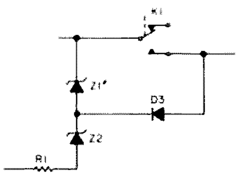


Fig. 6. Zener arrangement for improved resolution in setting turn-on voltage.

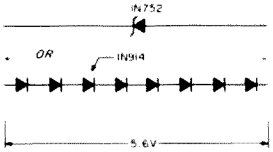


Fig. 7. Series-diode substitute for zeners. Any silicon diodes will do. 1N914s or 1N4001s are fine.

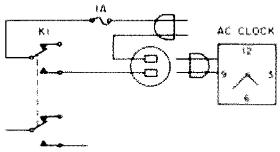


Fig. 8. Electric clock used as a timer. This requires an extra pole on relay K1.

Perfboard and Soldertail?

Definitely. What is commonly done is never written up (until now) but always appreciated.

L. B. Cebik W4RNL
2514 Dereck Drive, H-1
Knoxville TN 37912

Many ham authors specify perfboard construction for their one-time projects. Then they say almost nothing more about the mechanics of building the circuit on the board. Photos and sketches give us a general idea of the construction methods, but very few articles exist on using perfboard construction effectively. In the spirit of sharing some ideas that have worked well for me over the years (along with some cautions about a few things that lead to trouble), let's see how we can improve our perfboard projects.

Printed circuit boards for transistor and IC projects make construction a breeze. Unfortunately, PC boards are not practical for every project. If an author does not provide us with a source for ready-made boards (and we should not expect every author to make a PC-board layout for his own one-time project), then our willingness to generate our own boards depends on many factors, including time, ability, and desire to design and fabricate the etched pattern. For many small-to-moderate-size one-time circuits, perfboard construction is more practical.

Many types of digital circuits which use few passive components call for wire-wrap techniques. Most ham circuits, however, will require soldered connections. Therefore, we will concentrate on soldertail techniques applied to perfboard construction. Adaptation of these ideas to wire-wrap projects should be easy.

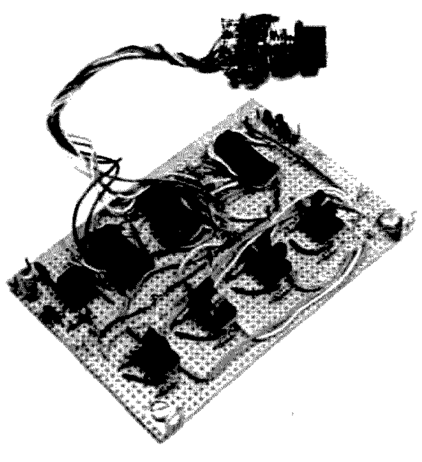


Photo A. An IC and transistor perfboard project with L-brackets for vertical mounting.

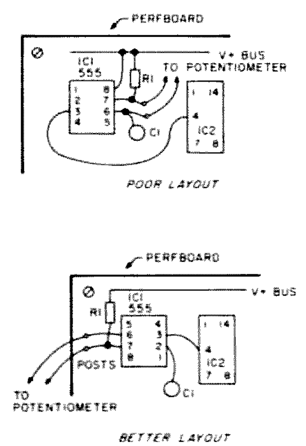


Fig. 1. Planning component layout on perfboard.

Handling Perfboard

Perfboard is generally made from a phenolic material, usually about 1/16th of an inch thick. This immediately limits its utility since it is prone to slight warps in readily-available grades. For PC boards, use the more stable epoxy glass material. For point-to-point wiring on perfboard, the warp is usually not significant in boards up to 5 by 7 inches.

There are several hole patterns for perfboard. Hole separations of .1, .187, and .2 inches are common, but .1-inch hole spacing is the most practical for ICs. For most uses, .042-inch hole diameters are best, although .062-inch hole diameters are available. The smaller holes again work best for IC projects. In fact, the .042-inch holes on .1-inch centers precisely fit the needs of ICs and their sockets. Conveniently, Radio Shack carries this type of board in three sizes: 2.75, 4.5, and 8 inches long, all by 6 inches wide. My own preference is to buy the larger sizes and cut the precise size board my latest project requires.

Phenolic material has some of the properties of mica in that it chips in jagged layers and does not break cleanly. However, with only a little care, it cuts and drills easily. A hack or coping saw with a fine tooth blade cuts perfboard well if you align your cut with a row of holes. Keep the saw blade as parallel to the board as possible, with no more than a 30-degree angle. This technique reduces binding as you pass holes, and the result is fewer broken phenolic scraps. For safer sawing, I clamp the perfboard between two quarter-inch-thick lath strip scraps with a bench vise. The edges of the lath strips are within a row or two of the holes I intend to cut along, which stabilizes the perfboard, and the vise cuts into the wood and not the phenolic. I keep any leftover pieces of perfboard more than one inch square, since I never know when I might need one for a miniature project or a small circuit addition.

Drilling perfboard for screws and other hardware is fairly simple. Use a scrap of wood to back up the perfboard when drilling; this prevents drill-bit snags that can shatter a small board. In general, a 1/8-inch diameter drill bit clears 4-40 screws nicely, while 9/16 is the correct drill-bit size for 6-32 screws. I usually avoid drilling holes larger than 9/16-inch diameter in one try since the large drill bits tend to snag the phenolic material more easily. For larger openings, drill out the perfs inside the desired perimeter until the scrap falls out and then file the material to the final opening size. Another technique is to drill the corner holes, insert a coping saw blade, and saw the opening. You will usually still need a bit of finish filing. One of the advantages of perfboard is that you can add larger openings for relay sockets and other components more readily than with PC boards.

Generally, I try to do all necessary drilling and cutting at one time before mounting components to get in the way of clamping and backing. There are few more frustrating accidents than to have your complete circuit wired, only to watch the perfboard crack or shatter as you try to drill just one more mounting hole.

Perfboard Layouts

One secret to easy electronic construction is paper. The more complete your plans, the more smoothly the project will go together. Even if you are reproducing an author's circuit exactly and have good photos to guide you, paper planning still can save you time and frustration. As inexpensive as many of today's components are, paper is still cheaper.

Example 1. Being able to cut and drill all holes before wiring is a matter of knowing just where they all go and what size they must be. Making some trial paper templates using the real components you have on hand will allow you to determine their size and spacing.

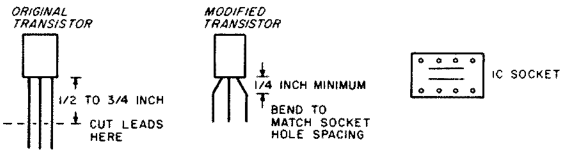


Fig. 2. Trimming transistor leads to fit IC sockets.

In addition, the practice also will let you revise the project and spot errors or neglected needs. You can see how much room you need to clear the mounting brackets or posts, how much space the transformer mounting foot requires, and how much filing you will need to do after cutting a hole for a relay socket. Then you can plan the circuit details so that everything will fit conveniently.

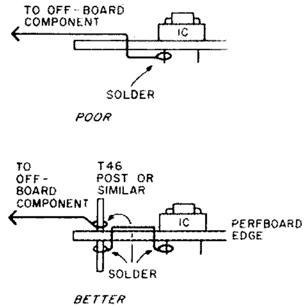


Fig. 3. Using posts for off-board connections.

Example 2. Equally important is the component layout. Fig. 1 illustrates two important considerations: socket pin orientation and component placement. The IC timer, a 555, runs its timing components to pins 6 and 7, while the output emerges from pin 3. Even though we conventionally think of "upper left" as the proper place for pin one, this project calls for an "inverted" placement of the 555 socket. Now the timing components are near the board edge so that leads to the potentiometer are conveniently reached. Too, the output pin is close to the input pin of the next IC.

In digital circuits, socket placement can make jumper wiring either easy or a jumbled nightmare. In counting and readout circuits, you may have several outputs to several inputs. Aligning the jumpers neatly makes short work of the wiring. Having them go over and around an IC to reach the input pins invites undetectable open circuits and other typical building problems.

Leave room enough for the components that go between sockets. Perhaps the best way to be sure your plan will work is to trial-fit all components on uncut perfboard. This practice often reveals unnecessarily long leads and other minor wiring problems before you cut leads. The result is often a revised layout plan. Sometimes, when I am smart enough to have a large extra piece of perfboard on hand, I place all components on the supplementary board. Using this model, I mark the project board for cutting and drilling. Then I move the

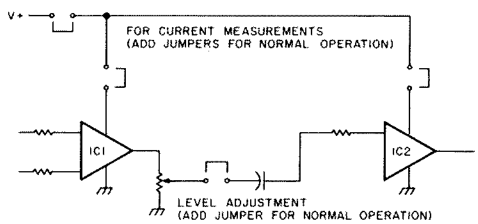


Fig. 4. Using posts to separate circuits for testing and adjustment.

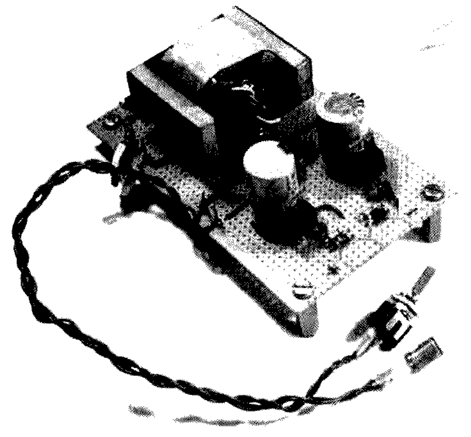


Photo B. A dual-regulated power supply on perfboard supported by posts.

components, one at a time, to the project board. This technique tends to cut considerably both assembly time and errors.

Transferring a layout plan to perfboard requires only a pencil and ruler. Measure and lightly mark the positions for holes. You also can mark the corners of IC sockets and large components for reference. The only precaution here is to eliminate pencil markings completely before covering them with components. Pencil lead is a conductor: not a good one, but good enough to have given me an additional input to a CMOS IC in one project. Erase pencil marks thoroughly just before mounting components.

Handling and Wiring Components

It would be impossible to establish guidelines for handling every kind and combination of components you might encounter, but the following ideas are adaptable to most projects.

First, use IC sockets wherever possible. Use them not only for ICs, but for switching transistors as well. An 8-pin DIP socket will handle two small transistors if you trim and bend the leads as shown in Fig. 2. The advantage of IC sockets over readily-available transistor sockets is that the latter require a fairly large hole through the perfboard. The IC socket rides atop the board with its pins sticking through.

Second, use posts for all off-board connections. Do not run off-board wires directly to components or socket pins. The strain may be too much. Fig. 3 shows

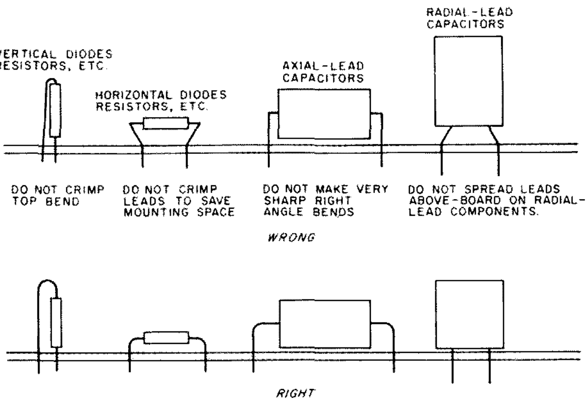


Fig. 5. Mounting components to perfboard.

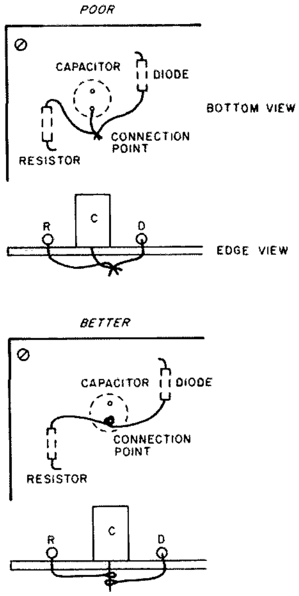


Fig. 6. Under-board component-lead junctions.

the right and wrong way to connect off-board wires. An added advantage of posts is that you can connect and disconnect off-board components from the top side, which makes final assembly of the project a much easier matter.

There are many additional uses for posts, a few of which are illustrated in Fig. 4. You can separate stages of a circuit until after testing by using a pair of posts at the output/input point; a jumper then connects the two circuits for normal operation. This technique permits you to adjust interstage signal levels with no danger of overloading the next device. Paired posts, again jumpered for normal operation, also permit current measurements during the test phases of a project as well as during troubleshooting. I prefer Vector T-46 wire-wrap posts, available through Jameco and other mail sources. The T-46 extends .4 inches above the board and .56 inches below. Its square shank and flare give it good holding power in the perfboard hole. After all soldering, trim the above- and below-board lengths. Below-board, be sure that

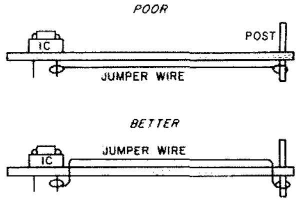


Fig. 7. Mounting jumpers on perfboard.

the post does not touch the chassis or cabinet base. Above-board, cut the post to the height of the tallest circuit component. Wire cutters do the job nicely.

Third, do not crimp components when bending their leads. Some builders prefer to top-mount all components. For this technique, Vector T-42 posts (or similar) permit soldering up to about three leads per junction. However, this method usually requires more space than making direct connections with component leads bent to pass through the board. Fig. 5 shows some right and wrong ways to handle components such as resistors, diodes, and capacitors. Axial-lead components such as resistors require curved bends to avoid eventual lead breakage. Often this takes one more hole, but that is a small price for circuit reliability. Where space is at a premium and component interaction is not a problem, vertical mounting is practical. Wherever you take care in smoothly bending component leads, you will encounter fewer cases of component strain or breakage, even if your layout does not permit instant solder support.

Fourth, when you use component leads to make connections, decide in advance for every junction which lead will serve as the key or post lead. Fig. 6 illustrates the idea. The capacitor lead serves as a post to which the resistor and diode connect. The reasons for choosing the capacitor lead

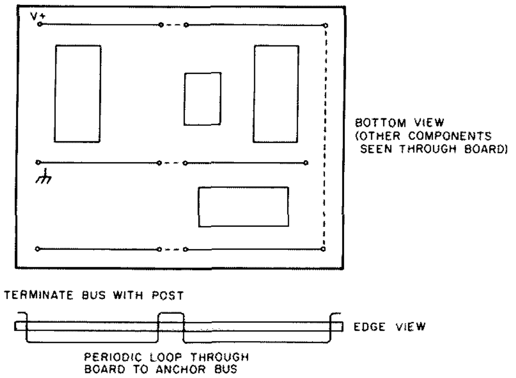


Fig. 8. Perfboard power and ground buses.

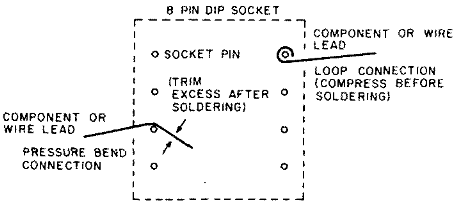


Fig. 9. Soldering leads to IC sockets.

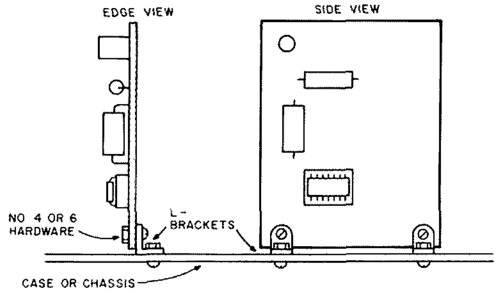


Fig. 10. Mounting single perfboards vertically.

in this example are three. The capacitor lead is the fattest and strongest and thus makes a better post. Too, the capacitor is permanent, whereas the resistor may require another value after testing the circuit. Finally, the capacitor can stand soldering heat somewhat better than the diode.

This case gives only a small sample of the reasons why one or another component may become the junction post; each will have its own rationale. Nevertheless, avoid bringing leads from many directions and simply twisting them together. The under-board layout may be as crucial to reliable circuit operation and ease of revision as top-board component placement.

Fifth, run jumpers topside and through the board at their ends, as shown in Fig. 7. This technique serves several useful purposes. It permits you to trace wiring after the board is mounted. It also takes the strain off the jumper wire, especially if you happen to snag it during construction. Standardizing on top-wire runs also reduces the chances of losing track of jumpers while building. Although excessive looping of jumpers creates an unsightly project board and potential trouble in sorting through the maze, do not put excessive strain on the wires to pull them flat against the board. Leave enough slack to prevent wire breakage, either immediate or later. Then press the wires into place.

These simple guidelines to component handling are mostly matters of common sense. You can add to the list according to your own building experiences. Unfortunately, we often forget these rules while building, usually through either haste or distraction. There is nothing like a soldering iron burning a hole in the test bench to cause us to mishandle a component. If we could only remember which component we were installing during the incident, we would know the first place to look when the circuit malfunctions. If you do not believe it happens, I have two look-alike IC voltage regulators, one positive, one negative, that I once installed under just such conditions. That neither works is proof that I put each where the other should have gone.

Wiring Perfboard Projects

Wiring and soldering a perfboard project can be one of two things: easy or frustrating. Easy wiring requires that we figure out the best way to handle the peculiarities of attaching components and wires to a phenolic board with a hundred small holes per square inch. I wish that I had known what I now know (through experience) back when I miswired my first perfboard.

No. 18 copper wire is the largest that will fit through the .1-inch holes of IC perfboard. For most purposes, No. 18 wire is too large for all but heavy current buses, such as voltage and ground lines on a TTL project. No. 22 or 24 solid hookup wire works best for most wiring. Anything smaller grows hard to handle and solder. We can make off-board connections with stranded wire of the same size.

If we have made a good layout plan, the wiring task should be straightforward. For non-rf projects, I usually begin with voltage and ground buses, arranged as shown in Fig. 8. Long runs pass above and below the board at least once to anchor them in place. Rf projects that require large areas for the ground plane may not be the best projects for perfboard techniques. For dc and lower ac frequencies (up to a few MHz), perfboards and buses work well. Jumpers provide voltage and ground connections to the individual components.

Wiring IC sockets presents problems to many builders. Whether working with PC or perfboard, we manage to lose the sockets as they fall off the board the moment we turn it over to solder. There are many tricks to hold the sockets in place. If there will be unused pins, bend them inward so that the socket lightly grips the board. Some builders put a tape loop under each socket to secure it during construction. Alternatively, you can use a small flat box on which to lay the inverted board for the first socket pin solder job. Whatever the technique, solder all the power and ground jumpers first; this will lock the socket in place for the rest of the project.

The traditional rules of soldering state that every solder joint should first be a solid mechanical connection over which we then flow solder. The solder seals the joint, ensuring a long-lasting electrical connection between wire and terminal. PC boards, of course, violate the old rule as a matter of course. Component and socket leads pass through the holes and, in fact, may not touch the pad. Solder, electrically and mechanically, connects the two. So long as we do not exceed certain weight and vibration limits, the connection will be good for a long time.

Perfboard construction requires that we connect jumpers and component leads to socket pins. Fig. 9

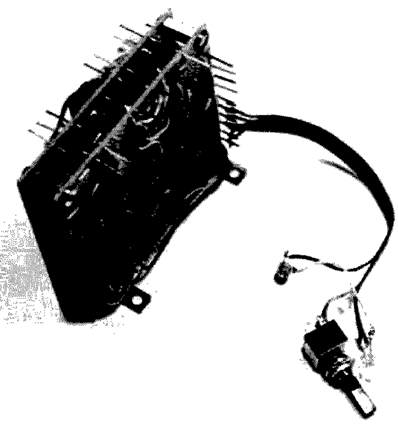


Photo C. A two-board IC and transistor project ready for vertical mounting.

shows two common techniques, and most builders use both in the course of wiring a single IC socket. No. 22 or 24 wire will bend in a loop around IC socket pins with room to spare for the loop to the next pin. However, circumstances often dictate that the partial-bend connection is most practical. Ensuring a good connection is a matter of making sure that the wire in fact touches the socket pin with natural tension before soldering. Unless the lead is under considerable stress, the connection will hold indefinitely. Use a small jeweler's awl to test each such connection before being satisfied that it will hold.

Whatever the construction method, small components used in modern circuits require careful handling. Radial-lead capacitors, such as the small electrolytic type, should be flush with the board. Unless we are careful, they will fall out of position when we flip the board to solder. Resistors, disc capacitors, and diodes should be close to the board, but not necessarily pressed too tightly lest we crimp the component lead. In many cases, the lead is stronger than the component itself. Where this is true, let the lead support the component. Diodes and transistors are sensitive to solder heat, so care is in order. Being sure that the component is mechanically well connected ensures that we can solder quickly with minimum heat. Earlier figures showed the techniques for handling jumpers and off-board connections. Finally, never solder an IC or transistor socket with the device in place.

There are two methods for wiring and testing a solid-state project. One is to wire and test each stage, one at a time. This permits ready circuit revision in early stages before component space has disappeared. For many types of IC projects, it is more convenient to wire the entire circuit and then test the stages by plugging in one or two ICs at a time (with power off and capacitors discharged). With either method, it is safer to remove ICs while making circuit additions or revisions. The IC that will fry due to static charge or excess heat is the unit of which we have only one.

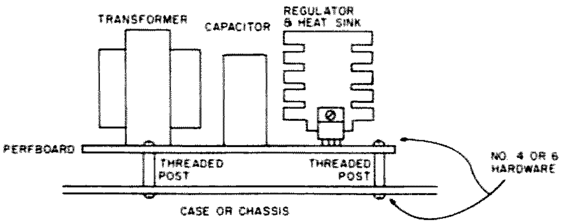


Fig 11. Mounting perfboards horizontally.

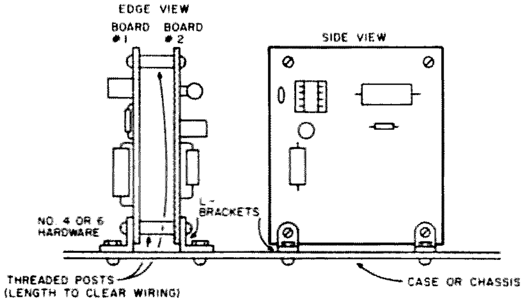


Fig. 12. Vertically mounting two perfboards.

Mounting Perfboards

The photos, besides illustrating perfboard construction generally, show different types of mounting schemes. Basically, there are only about five ways to handle the attachment of perfboards to your project case.

Fig. 10 and Photo A illustrate simple vertical board mounting using L-brackets. Digi-key and other mail sources carry this common but surprisingly hard-to-find bracket. Be sure that the board clears the case with about an eighth of an inch to spare so that you have room to align the L-brackets with the case and board holes. This is perhaps the simplest vertical mounting scheme, but it is limited by the weight and size of the project board as well as anticipated rough handling of the entire project. Vibrations transmitted to the free end of the board have considerable mechanical force.

The most common method of horizontal mounting appears in Fig. 11 and Photo B. The drawing shows mounting posts threaded for 6-32 screws. Note that in this case the transformer hardware doubles to connect to the post. The object is not to save two screws (although the space they take might be handy for other circuit components). Instead, the mounting posts support the transformer's weight directly. Had the project used comer posts, a few hard knocks might let the transformer crack the perfboard. Horizontal mounting with four-corner support is superior to L-bracket mounting only if the expanse of perfboard does not support too heavy or too dense a weight.

In most cases, hollow pillars and long screws make a perfectly acceptable substitute for threaded posts. We need not buy commercial posts, but can make our own from rigid plastic tubes. In fact, exploring the plastic packaging and worn out parts of many household items is a good way to build a stock of very useful plastic pillars, standoffs, and other items.

We can achieve superior vertical-mounting stability using two boards with a combination of L-brackets and posts. Fig. 12 and Photo C show how. Each board has its own L-brackets for four-point support. Posts connect the two boards at the four corners. With this technique, the builder can remove each board independently for repair or revision. Photo C shows separate automatic voltage- and current-measuring circuits (for a bench supply) back-to-back. The only cautions to observe with this mounting method are to ensure that the two circuits will not interact through radiation or capacitive coupling.

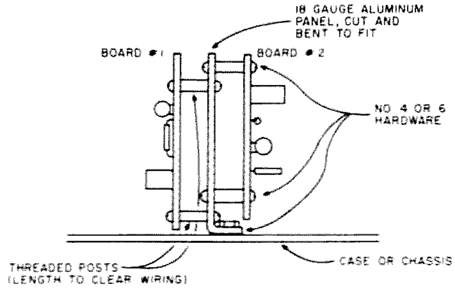


Fig. 13. Perfboard mounting with interface shielding.

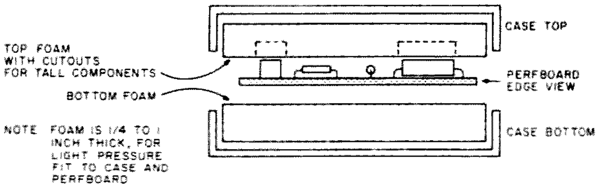


Fig. 14. Packaging perfboards in foam.

Where circuit isolation is important, Fig. 13 comes into play. Two boards conveniently fit to one aluminum shield panel. The 18-gauge or thicker aluminum panel supports both boards and the builder can remove each independently. This technique is limited to cases where a simple interface shield is adequate to prevent unwanted interaction between circuits, which includes most low-power receiving and test equipment applications.

Modern packaging techniques have taught us that rigid physical mounting is not the only route to good circuit protection in the project case. For small projects, a floating mount may be both simpler and more effective than nuts and bolts. Fig. 14 illustrates the general principle. The circuit board rides between two foam pads within the case. The case presses the foam lightly to hold it in place. The light pressure also holds the perfboard securely in its place. If there are some projecting components, we can cut a few indentations into the top foam panel. This form of mounting works very well as long as the foam can exert enough pressure to lock the perfboard in place without over-stressing any of the components.

These sample mounting methods may add to your repertoire of packaging techniques. In any event, plan your packaging during the layout stage of the project, since perfboard mounting will determine some of the cutting, drilling, and wiring requirements. Of course, these mounting techniques also apply to numerous other construction techniques.

Although perfboard is handy, it is not the ideal construction base for all projects. As noted, some rf projects may require ground planes that perfboard alone cannot provide. Where PC boards are available for projects you do not want to modify, use them. However, for the one-time ham project of moderate size, perfboard construction can be as satisfactory and durable as any other. It all depends on how you handle the material. Hopefully, the collection of ideas out of my experience will spur you to share some of your own with the rest of us who regularly build with perfboards and soldertails. ■

✓ See List of Advertisers on page 98

Robert H. Johns W3JIP
3379 Papermill Rd.
Huntingdon Valley PA 19006

Watch a Warhorse Work

With a new tank circuit, the SB-221 does great things for 160 and 10.

The conversion of an amplifier to operate down on 1.8 MHz involves more than adding a coil tap and a switch position, as the 10-meter conversion usually does. A new and larger coil assembly is required, as well as a plate choke and a filament choke with larger inductance. These add up to several components and some expense. There is plenty of room in the SB-221 to place the new components, however, making the conversion a simple one. The most difficult job is removing the switch deck that shorts out the sections of the main-output π-network inductor, and then replacing it after modification.

The SB-221 as designed by Heathkit™ comes with a 10–11-meter reject filter and tuned input circuits for 80, 40, 20, and 15 meters. All being bypassed leaves the amp with an untuned input.

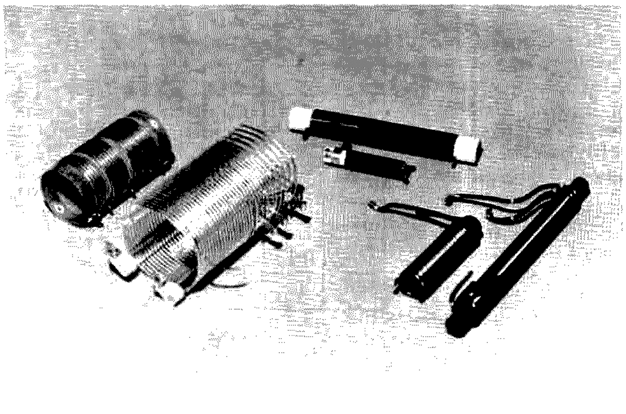


Photo A. The new components to be added to the SB-221 to convert it for 160-meter operation. The new component is the larger one in each case. The smaller original ones were removed from the amplifier.

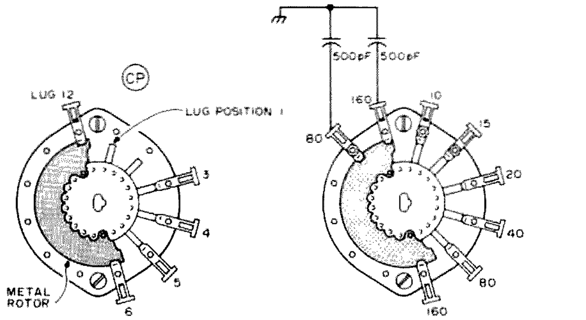


Fig. 1. The rear deck of the bandswitch as shown in the Heathkit assembly manual is at left, and the modified deck is at right. Three new switch contacts are added using new fingers or ones salvaged from old switches. They are mounted on both sides of the ceramic wafer, using #2 brass nuts and bolts. The mounting holes are already in the wafer; no modification to it is needed. The work on the switch is easy; the hardest part of the whole conversion is removing the deck and putting it back again.

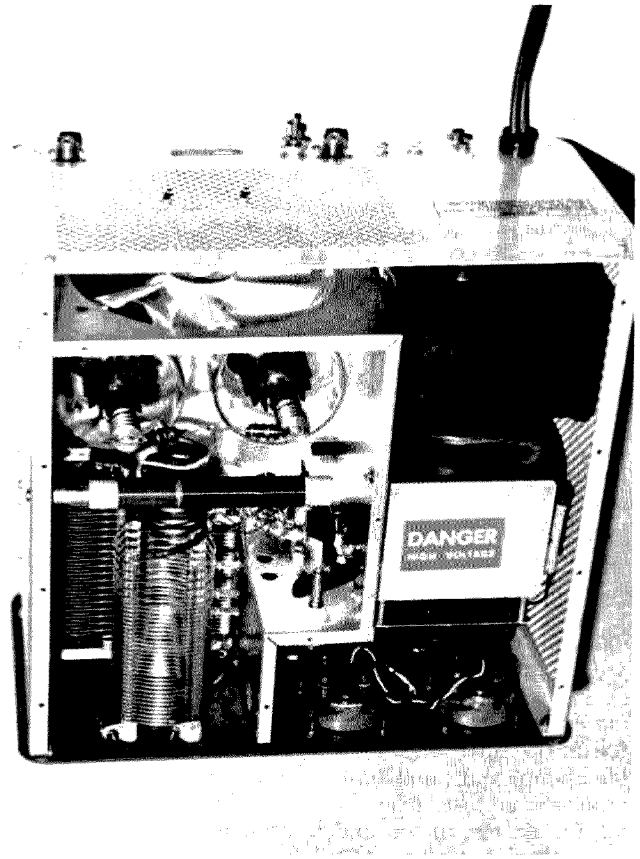


Photo B. The SB-221 converted for operation on 160 through 10 meters. The new tank coil is mounted on the front panel, using two holes that previously held a plastic Heathkit label. The new larger plate choke is mounted on the wall at left, using the original plate-choke standoff. The bandswitch is removed from the partition wall, modified, and replaced.

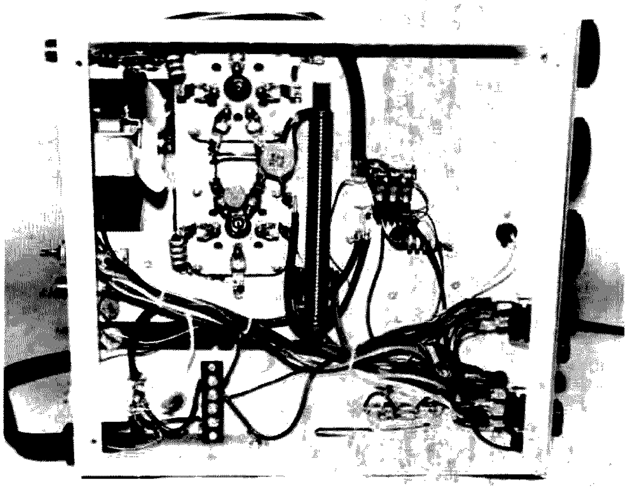


Photo C. Bottom view of the amplifier with the larger filament choke installed. It solders into the same points that the original choke did.

The new output tank coil is approximately 33 μH which uses all of the 250-pF tuning capacitance that is available to resonate at 1.8 MHz. Although a larger capacitor would give a better Q, the resulting efficiency of the amplifier is almost as good on 160 meters as on 80 meters, so that the output on 160 will not suffer from lack of a larger tuning capacitor. Additional output capacitance is also switched into the π-network to provide a 50-Ohm output on 160.

Components

Photo A shows the new components added, with each one next to the corresponding one removed from the SB-221. The new plate choke has an inductance of 200 μH rather than the 50-μH original choke. This is the Barker & Williamson Model 801. It is space-wound over about one third of its length to avoid parallel resonances at the higher frequency bands and close-wound for the rest of its length for greater inductance. The B & W filament choke, FC-25A, has about six times the inductance of the smaller Heath choke and is used to prevent the drive power from going back to the filament transformer or to ground. The plate tank coil is a B & W 195-3, a variable-pitch coil using #14 wire, 2½" in diameter, 5¼" long. It is mounted on the front panel using the two holes that originally held the Heathkit label. Cable clamps around the plastic rods of the coil support it. These are furnished with the coil.

Construction

After taking off the cover and refamiliarizing yourself with the layout, remove the 3-500 tubes. To bypass the input circuit, connect a length of RG-58 from terminal 4 of the T-R relay directly to C32 at the tube sockets. Remove the coax cables that had been connected to these points and cut them off where they pass through the chassis into the grid compartment. Ground both ends of the braid of the new piece of cable.

If the stiff wire leads on the new filament choke are bent as in Photo A, the larger choke will fit, using the same solder points as the smaller choke (see Photo B). Make sure that the filament choke is close enough to the chassis that it will clear the bottom of the case.

Remove the rf plate choke (Heath #45-61) by unsoldering both wires to it and unscrewing it from the spacer. Save this spacer to mount the new choke. Put a 6-32 nut on the long bolt sticking out from the partition to prevent it from falling loose, and cut the excess bolt off. Drill and tap one end of the 3/8"-diameter spacer for 1/4"-20 threads and put a 1/4"-20 stud into that end. This will thread into the ceramic form of the new choke. This spacer is mounted on the opposite wall of the amplifier (Photo C), using an 8-32 screw through one of the perforations in the wall.

Remove both the 80-20 coil and the 15-meter coil made from silver-plated tubing. Save this 15-meter coil; it will be used in the modified version, tapped for 10 meters. Leave the fiber standoffs that had held the old tank coil in place so that the screws holding them don't fall into the grid compartment.

Unsolder all of the wires and the capacitor from the rear deck of the bandswitch. By reaching down behind the panel with needle-nose pliers, you can bend back a tab on the outer part of the detent layer. This lets the switch rotate through 12 positions rather than the original four. Since the input circuits are no longer utilized, the back wafer that switched the coil is all that need be changed. Remove it by

loosening the bolts that hold it to the partition wall. The nuts will fall down into the grid compartment and must be recovered. Three new contacts must be added, as shown in Photo D. This is not so difficult. Many switches have similar contacts. Drill six out and mount them in the holes already present in the ceramic deck with #2 hardware. One of the new contacts is for the extra loading capacitor for 160.

The reworked switch deck is replaced, using the original hardware and spacers. Getting the nuts back on the bolts when they are almost hidden is a nasty job. Bend a piece of wire to hold the nut and get it started.

The new switch positions are shown in Photo D. No change was made to the switch labels on the front. There is no confusion, however; the 160-meter position is the one to the left of 80, and the 10-meter position is to the right of 15.

The Heathkit plastic nameplate is removed by prying off the Tinnerman nuts, leaving two holes to mount the new coil behind the front panel. Plastic cable clamps and small angle brackets are attached to the plastic ribs of the coil, as in Photo A. The 160-meter end of the tank coil is soldered to a lug attached to the front of the loading capacitor. There is room to remove the nut from the threaded rod there and put a solder lug under it. At the other end of this rod another solder lug is placed under the nut and a heavy wire run down to the 160-meter switch terminal, where the output wire running to the T-R relay also is connected.

The 7-turn 15-meter coil is connected from the tuning-capacitor top plate to meet the main coil, as in Photo C. This involves bending the tubing at the ends and cutting some from the coil. Be sure to keep the approximate size and spacing the same.

The 10-meter tap on the tubing coil is 4½ turns from the tuning-capacitor end. The 15-meter tap is now 6½ turns in, not at the junction of the two coils. The tap for 20 meters is 2¾ turns from the junction, 40 meters is 7¾ turns from the junction (5 turns from the 20-meter tap), and 80 meters is 4 turns from the 40-meter tap. These taps are made with clips furnished with the tank coil. Connections between coil and bandswitch are made with #14 solid copper wire, as in Photo C.

An additional 500-pF, 1-kV output capacitor is soldered to the bandswitch. It is placed next to the original one for the 80-meter band. The shorting rotor connects both into the output on 160, as shown in Photo D.

The tank-coil taps can be checked with a dipper before applying voltage. The tubes should be in place (but no power applied) since they will contribute to the capacity of the system and affect the 15- and 10-meter tuning. The 15- and 10-meter bands should resonate with the main tuning capacitor near minimum, beyond the shaded area marked 20–15 on the panel. Small changes can be made by stretching or compressing the turns of the coil, and larger inductance variations by changing the location of the taps.

An improperly located coil connection will show up as inefficient operation on that band. If the inductance is too large or too small, the power out will be reduced for a given amount of drive. It is worth measuring the power into a dummy load to check on efficiency, rather than just being satisified with a resonance, a dip in the plate current.

A parts kit for this conversion is offered by Barker & Williamson, 10 Canal Street, Bristol PA 19007, for $49.95. The K-160 consists of the Model 801 plate choke, FC-25A filament choke, 195-3 π-network inductor with taps and mounting clamps, and a 500-pF output capacitor. ■

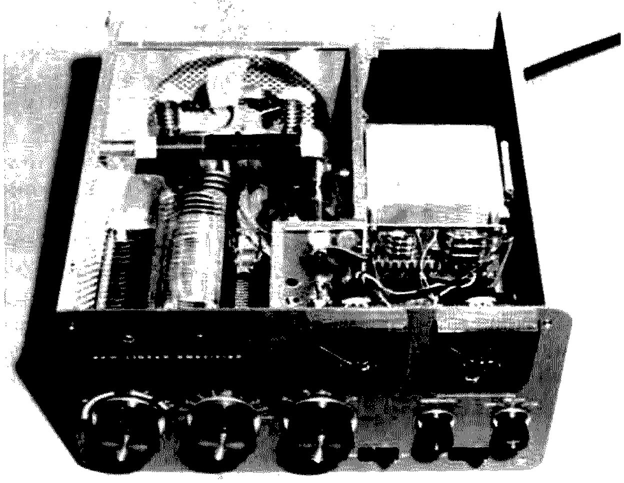
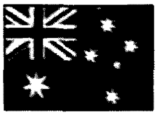


Photo D. Front top view of the modified SB-221. The two screw heads above the capacitor knobs are the only outward change in the appearance of the amplifier. The 160-meter position on the bandswitch is the one to the left of the 80-meter position; it need not be marked. Similarly, the 10-meter position is the one to the right of 15 meters.

73 INTERNATIONAL

Each month, 73 brings you ham-radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Perry Donham KK2Y.*



AUSTRALIA

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Australia

ABE VKS BAD OSLERS?

It has become noticeable lately from on-air contacts and correspondence that the VKs are getting a reputation of being bad QSLers. After looking at my log books over the years, I disagree, and feel, in fact, that the opposite is true. I will give an example later of why I feel this way.

WIA QSL Bureau

The Wireless Institute of Australia maintains both inward and outward QSL bureaus in all states, with the VK3 bureau being free of charge to all members of the Institute in VK3. (Other bureaus in Australia do charge for this service.) Nonmembers still can collect their cards free of charge from the bureau, but a fee of 10 cents per card is charged for all nonmembers' outward QSL cards. This is still a lot cheaper than by mail.

The VK3 bureau, over the last three years, has handled approximately 410,000 inward cards and 320,000 outward cards. There is a total of 30,000 cards still uncollected at the bureau, and to remedy this, Inward QSL Manager Barbara Grey VK3BYK has tried for two years to contact all of their owners. Of the very few who bothered to reply, the comment was the same: "We don't want the cards; either send them back or destroy them."

These cards have now been sorted into alphabetical order by the Ballarat Radio Club and will be filed at the WIA club rooms for a further twelve months. If not collected by then, they will be sent back to the original sender with a notation on them stating that this person does not QSL.

Our Bad Apples

For example, one VK3 two-letter callsign has been heard on air saying, "I will QSL," but this station has over 500 QSL cards uncollected in the bureau. He quite blatantly states that he doesn't want them. A case of one bad apple giving the whole box a bad name.

A recent article in one of our local radio magazines reported a request to the Federal Bureau of the WIA by a licensed member of the WIA to either destroy or send back cards sent to his XYL—also an amateur but not a member of the WIA. The intimation is that she will receive cards direct only with the appropriate green stamps or IRCs for return of cards.

While I can sympathize with her as, being a semi-rare YL DX station, her cards must be in the thousands per year and be a drain on her household budget, I can also sympathize with those countries who have amateurs on very low incomes who cannot afford to get green stamps or IRCs to send for direct QSLs and must use the cheapest method available, the bureau, to confirm a new YL country.

So I would suggest that if you receive one of your cards back marked as a non-QSLer, don't blame all of us, just contact the offending station again on air and give them a good idea of what you think of people who say they will QSL but don't; they are damaging the image of all VK amateurs by their inconsiderate actions.

The SWL

While I have no grievance against the vast majority of SWLs, I do object to receiving cards back to me via the bureau from an SWL listing a three-year-old contact with a station that perhaps lasted only one minute with "via the bureau" crossed out and a request for a card "direct to PO Box so and so." No way is a card going back direct to that station—not with the cost of direct QSLing these days.

One of the last batches of QSL cards by the bureau to me contained sixty cards. Thirty-five were SWLs of which three asked for direct QSL cards. Result: Thirty-two SWL cards went by the bureau, three went into the rubbish bin.

No Log Required

The request by an SWL for confirmation of a contact with a station is going to be even harder in future because as of late 1983, the Department of Communications granted us the privilege of not having to keep log books except in the cases of emergency situations, club stations, or when directed to do so by the DOC.

This puts us in a Catch-22 situation where if we don't log every station we work, we can receive a card from an SWL for a confirmation of a contact that we have worked, but not logged. What do we do? Enter every contact, just to satisfy the many SWL listeners? Not log them and send cards back with "Sorry, OM, not in the log," even when it was a good contact?

So, if working a VK station, this makes it more important than ever to ask for a QSL if you want a card, so that your callsign will be entered into the log book. Very few Australian amateurs object to a request for a QSL card to confirm a contact; it has been a common practice since the inception of amateur radio. However, I, for one, do not enter all my contacts. Unless a QSL is asked for during the contact, I assume a card is not required. It is only a common courtesy to ask, and, if not in the log, no card.

Who is in the wrong? Am I, for not logging you, or, you, for not asking, "Do you QSL?"

Are You at Fault?

Going by the above, we do have some problems, but some overseas amateurs requiring a QSL card also have contributed to them by not doing the right thing when sending their cards. I will mention some of the problems we are having over here with your cards.

- Incorrect callsign on the cards; for example, VK3E—. The VK3 bureau has a lot of cards addressed this way. Probably a VK2E-- was meant since no E suffix has as yet been issued in VK3.
- How do you make your "V" in VK? The bureaus are getting a lot of cards that can be either VK3 or UK3. Much time can be lost by the unpaid QSL managers trying to sort out the problem. How many of your VK cards are at PO Box 88, Moscow?
- Undecipherable scrawls or hieroglyphics for the callsign that might look great on ancient parchments make the job of the person sorting thousands of cards at a time much harder. So please print callsigns in clear, precise letters and make sure you get *your contact's* callsign *correct*. With some of our current suffixes starting with phonetically similar letters (B-C-D-E-P-V), it pays to double check.

I notice in the listing of VHF contacts by the *Columbia a* contact with VK2PMN. I don't see how that can be as the P suffix denotes a Novice operator who, as such, cannot operate above 30 MHz. Was this a typical suffix mistake that also is being reflected by cards coming into our bureau?

However, let me state here and now that VK is not the only country with QSL problems!

Only 65% Card Return

In 1978, with the 10m band wide open virtually 24 hours a day, I had great fun with a 6-element cubical quad, working all around the world at all hours of the day and night and averaging 800 contacts per month. Most of these were QSL via the bureau. Checking the logs for that year, in 1981, I was surprised at the blank spots still in the QSL-returned column. It worked out at only a 65% return of cards.

Taking the price of QSL cards into account, that worked out at a yearly loss of *around* US$200 *for non-returned cards.* Needless to say, my QSLing became more selective, to the point that now I QSL only on receipt of a card, either direct or by the bureau.

Pirates

Are you sure you are actually working a licensed amateur? The ease with which anybody can buy amateur transceivers over here, with no questions asked, is not funny. It is soon to be stopped (we hope!). With today's large sals of CB rigs able to operate in the 28-MHz band plus an abundance of articles telling you how to convert the older CB sets to 28 MHz, it would pay you to make double sure that you are indeed working a licensed amateur. We do, like a few other countries, have our pirates.

One classic example involves the genuine call of Art Cooledge VK0AC. There are over 200 cards in the bureau for a person calling himself Bob and using this call. These cards will be going back to the sender, as Bob was a pirate. There are many other cards at the bureau that are, also quite obviously, from pirate operators.

Another case in point happened last year in VK3. Direct QSL cards were arriving at the home of an SK for contacts with him months after he died. As his wife was still living at the *Callbook* address, you will understand that this was upsetting her quite a bit. As her husband had a two-letter call and these are much sought after by other amateurs, her problems were solved by issuing her *deceased* husband's call to another licensed amateur to reactivate. As this particular amateur was well known on air, anybody else using his new reissued call would be easily detected.

This change of call in VK is accomplished by a simple procedure. When an amateur becomes a silent key, his callsign cannot be reissued for a period of two years. However, if a member of his close family requires the callsign, it will either be reserved or reissued to them. If the family does not wish to keep the callsign, it is possible for another amateur to get written consent from the closest relative to the deceased to take up his old callsign before the two-year period expires.

This gives you another problem with QSLing, as, in the above case, it is possible to have two owners of the same callsign only a few months apart.

So, if the station you are working says his QTH is near Melbourne, for instance, ask him his exact location, then look in a late *Callbook* to confirm his name and location before sending off that QSL card. I reiterate: Use a *late Callbook* because a lot of the two- and three-letter callsigns have been reissued over the last few years.

Direct QSLing

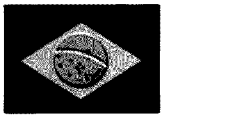
Speaking of direct QSLing, *although* Australia is called "The Lucky Country," not all of us are millionaires. You will find the usual cross section of the population involved in amateur radio, including students, pensioners, handicapped operators living on an invalid's pension, young marrieds with the usual mortgages and rearing children, etc. All of these people face the

common problem: The cost of QSL cards can be a noticeable drain on meager finances. Add to this the practice of some overseas operators who send unexpected cards direct airmail with no return postage included and request a card back the same way, which happens quite often, and we can be in a dilemma as to what to do. A letter to Europe airmail is A$.85 plus card and envelope. It works out at around US$1.00 per letter, and it is not much cheaper sending it by surface mail. One week I had five ot these letters.

Do I pay US$5.00 out of my own pocket just to confirm contacts with a country they have probably worked many times before? Do I instead send the card back by the bureau, knowing it might take two years to reach them or that they may never get their card if they are not a member of their local bureau? The result of the latter could be more overseas amateurs saying that the VKs are lousy QSLers.

While this is not the full story of QSL problems, I hope it will partly explain that it is not all our fault and that where we are at fault we are trying to remedy the situation as quickly as possible.

The rest is up to you.



BRAZIL

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Brazil

Ivete Alvos Monaco PY2ADI
Grupo de CW de Sao Paulo
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As Public Relations Chairman for Grupo CWSP, I would like to announce two awards.

Our CWSP Award is for all amateurs who have worked five members of our group (CW only) with valid contacts after October 15, 1978. Submit a list certified by an official radio club, with suffixes in alphabetical order, date, band, and report. (SWLs same rules.) Do not send cards. Fee, 10 IRCs. For endorsements (one for each ten PY2s up through 80), send one IRC and an SAE.

CWSP members are PY1DG and PY2s AC, ACH, ADI, AES, APE, ARX, ASI, ATL, BTR, BWD, BZD, CAR, CJW, CMS, CPU, CZX, DCP, DHP, DML, DRP, DY, EGM, EMM, FEO, FT, FWR, FWT, GCW, GPA, IAP, ICN, IEJ, JN, OE, RAN, RVO, SI, SPA, SUB, SV, SZA, TO, TR, TRD, TUO, UZV, WG, WR, and XB.

The Brazil CW Award (BRCW) is issued by us for any radio-amateur stations working at least 15 different Brazilian states and territories from Brazil, *which stations already have earned all 6 endorsements for the CWSP Award.*

de PY2ADI

BRAZILIAN PPC MEMBERS AND COUNTRIES AWARD

As a special celebration during PPC's 20th year (March, 1984 to March, 1985), this oldest Brazilian CW group has just announced the PPCMC Award (CW mode only). It's a tribute to radio amateurs of all parts and to those who give their best towards CW development. The PPCMC Award combines all countries (ARRL list) and PPC members. QSOs must have been made on and after January 1, 1980.

Issued by the Brazilian Picapau Carioca Group, this award is available to all radio amateurs as a permanent competition.

Each ARRL country and each PPC member counts 1 point, only once, no matter which band, two-way QSO.

Basic Award—Two-way QSOs completing 50 points, involving at least 40 different countries.

Endorsements—Two endorsements, 25 points each, until 100 points; from 100 points to 150 points, 5 endorsements, 10 points each; from 150 points on, endorsements at any requested quantity, at will.

Honor Roll—Those reaching 200 points.

No QSLs needed. Send list (GCR) in suffix alphabetical order showing full details of QSL, verified and certified by a recognized amateur-radio society. Fee for the basic award is 5 IRCs accompanying applicant's QSL card with complete QTH information. For endorsements, send SAE and 1 IRC. Address PPC Certificate Manager, PO Box 2673, 20001 Rio de Janeiro RJ, Brazil.

de PY1CC

CHILE

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WORLD'S HIGHEST 2M REPEATER

For those of you who read our article in the June, 1983, issue of *73*, it may be of interest to know that the 2-meter repeater installed on the top of El Plomo mountain at 5,500 meters above sea level worked perfectly for about 4 months until the antenna broke down due to the heavy winter winds. Nevertheless, the repeater system continued to work (although the signal was extremely low) during all the winter season, and the repeater and solar panels suffered no damage.

Last summer, a group of hams climbed again to the top and repaired the antenna damage, replacing the old antenna with a very light and flexible whip which we hope will survive the coming winters.

By the way, we would like to hear from other hams around the world, just to know if our repeater is still the highest.

WACE AWARD

Radio Club de Chile continues to issue its WACE Award to all hams who send proof of contacts with each of the 10 Chilean zones. More details and information can be obtained by writing directly to: Awards Manager, Radio Club de Chile, Casilla 13630, Santiago de Chile.

RECIPROCAL LICENSING

During our summer months especially, many hams from various parts of the world visit Chile and make use of our reciprocal license agreements. In fact, Chile has official agreements with the following countries: Argentina, Brazil, Canada, Colombia, Ecuador, Israel, Uruguay, and the USA. Nonofficial but equally good treatment has also been given to hams from the Federal Republic of Germany, England, Panama, Spain, and Japan.

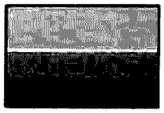
Chile is known for its skiing facilities during our winter months and for its trout fishing during summer on its many lakes and rivers south of Santiago.

During the past summer season, we enjoyed the visits, among others, of DK2BI, DK9WB, and DK6HH, who were here during early March, and also Lloyd and Iris Colvin of world fame, who at the time this is being written are still enjoying lobsters and DXing on Juan Fernandez Island. They also visited Easter Island for about 2 weeks and were able to make over 8,000 contacts during their stay on the island of the mysterious Mohais. We are sure that they will always remember their visit to CE land.

Patricio CE3GN (far right) and his wife, Ana Maria (center), with Lloyd and Iris Colvin, enjoying a barbeque at Patricio's QTH just before leaving for CE0Z.

COLUMBIA

Much has been written about Dr. Owen Garriott's flight and contacts from *Columbia*. Nevertheless, we would like to repeat the fact that only 2 South Americans were able to make it. The nice thing about it is that both of them are Chileans! Our congratulations go to Andres CE2AHD and Ignacio CE3CKE, who appeared on the official list of contacts.



COLOMBIA

Abelardo (Lalo) Santos V. HK3EOU
PO Box 88937
Bogota 8
Colombia

COLOMBIAN INDEPENDENCE CONTEST

The Colombian Radio Amateur League (LCRA), founded in 1933, will sponsor the CID 1984 Contest, running from Saturday, July 21, at 0000 GMT till Sunday, July 22, at 2300 GMT.

The Colombian Independence CW and Voice Contest will include the A category: single operator/single band, voice only, CW only, or mixed; B category: single operator/multi-band, either voice or CW only or mixed; C category: multi-operator but with single station, multi-band voice, CW only, or mixed operation; and the D category: multi-operator, multi-transmitter, multi-band, either voice or CW only or mixed.

There is also a single-band category for operators using 14 MHz against those operating on 7 MHz, etc. The bands of operation will be 1.8, 3.5, 7, 14, 21, and 28 MHz. The contest call will be, for voice, "CQ HK CONTEST," and for CW, "CQ HK TEST."

The QSO exchange for non-HK stations for voice will be composed of the signal report followed by three (3) digits starting from 001. For CW, the exchange is the RST report plus three (3) digits beginning with 001 as in the voice modality.

For HK stations, there will be a special procedure which includes the signal report, the number 174 (indicating the 174th Colombian independence anniversary celebration), and the QSO sequential number. The same will apply to the CW QSOs, namely, RST, the number 174, and the QSO number.

The scoring for non-HK stations will be: for working HK contest stations, five (5) points, working non-HK stations which are outside their own country, three (3) points, and working stations of their own countries, one (1) point.

For HK stations, working non-HK stations earns five (5) points and working other HK stations earns three (3) points only. For the combination of different countries contacted on each band as well as QSOs with different HK districts (there are 10) worked on each band, the usual multipliers will apply.

The total number of QSOs multiplied by the total of countries contacted and the different HK zones contacted in the different bands will give the definite numbers, the final score.

The log entries should include the time in UTC, callsign of station worked, report given, report received, multiplier, and the points corresponding to the QSO. Separate log sheets should be used for each band.

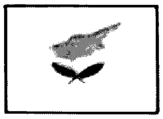
The multipliers should be indicated/applied only for the first QSO on each band. Finally, a summary sheet must be attached to each entry indicating the total points, category, name and address, list of operators in the case of multi-operator stations (if applicable), plus the usual contest declaration. The submissions not including a summary sheet will be considered only as check logs.

Sole conditions of entry for participation are that each participant should communicate with at least ten (10) HK stations on voice or five (5) HK stations on CW for acceptance by the Contest Committee and must submit written proof of a total of fifty (50) QSOs, ten (10) of them with HK stations on voice or five (5) on CW to qualify for any prize. Should the contester wish to work in the mixed category, he will need to contact only five (5) voice and five (5) CW HK stations. One contact per band with the same station is acceptable; cross-band or cross-mode QSOs are not valid.

Violation of the amateur-radio international as well as country's regulations or the contest rules, the lack of ethics, so-called "phantom QSOs," excessive duplications in the total number of QSOs—all will be reasons for disqualification by the

LCRA Executive Committee, and their decision will not be subject to appeal.

Logs should be mailed by August 30, 1984. Those received after December 30, 1984, will not be considered but will be gladly used as check logs. The entries must be addressed to: LCRA, Contests, Logs and Awards Department, PO Box 584, Bogota, Colombia, South America.



CYPRUS

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Cyprus

NEWS FROM CYPRUS

On March 10, 1984, the Cyprus Amateur Radio Society (CARS) held its annual general meeting and a new central committee was elected: Totoe Theodossiou 5B4AP, President; Aris Kaponides 5B4JE, General Secretary, and Pantelis Lytridas 5B4CF, General Treasurer. Members are Thanos Apostolides 5B4CR, Christoforos Demetriou 5B4EI, Sotoe Miltiadou 5B4JX, Andreas Pavlides 5B3AC, George Kourtellis 5B4DY (Nicosia), Stelios Ioannou 5B4AH (Famagusta), Nicos Hadjimiltis 5B4CV (Limassol), Andreas Christoforou 5B4JR (Paphos), Erricos Lanitis 5B4GJ (Larnaca), Glafkos Kariolou 5B4MM (Kyrenia).

A new UHF repeater was bought by CARS and soon it will be operational. At the moment it is being tested by the repeater technical manager, 5B4AH, and then a suitable site will be found.

Cyprus was represented in the CQ WPX Contest by four stations: 5B4MF, 5B4ES, 5B4LP, and 5B4EP.

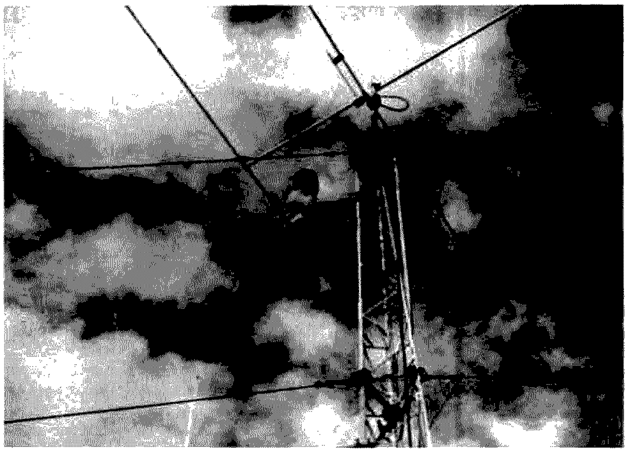
OM Andreas 5B4LP operated solely on 80m, and he claims that he has broken the continental record on this band. OM Marcos 5B4EP operated on 160m only with good results also. 5B4ES (the Nicosia English School club station) operated multi-operator/multi-band under the guidance of Dr. Larry Day 5B4LD.

During the last couple of months, the regular 5B4 DXers operated on all the HF bands. 5B4EP, during the mornings, was on 160m. On 80m, 5B4LP, 5B4MD, and 5B4JE were showing up most evenings, and on 40m, 5B4JE was working with a new delta loop antenna with the company of Roberto I2VRN (the strongest signal on this band from Europe). Also, several 5B4s were operating on 20m, 15m, and 10m. On the 10m FM mode, regular operators were 5B4MD, 5B4LP, 5B4MF, and 5B4JE.

Being a very small country with a handful of amateurs active on the bands, it is difficult to find news for publication, so I am going to describe some interesting amateurs on the island. Here is a short portrait of OM Nicos Hadjimiltis 5B4CV, who is also a neighbor and a very good friend of mine.

Nicos got his ticket in 1976; he is an engineer with a broadcasting station, specializing in antenna construction and erection.

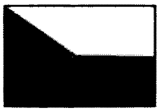
Nicos 5B4CV (left) with visiting friend DF3MG.



5B4CV doing some antenna work.

Nicos has been operating regularly on all bands and modes. He is a great home constructor, and among his constructions are an HF linear, a couple of antenna tuners (one of which is remotely controlled), power supplies, a TV camera, and other gadgets. His latest project is a Robot 400 converter for SSTV.

His is the only station in Cyprus operating now on RTTY and SSTV. Nicos is also the president of the Limassol CARS group and is one of the main helpers in running the Limassol club station; he always is prompt to help fellow amateurs.



CZECHOSLOVAKIA

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Czechoslovakia

Radio amateurs here, as of July, are licensed to work 1.8 and 10.1 MHz. On 1.8 MHz are those licensed for 15 W input maximum. 160 meters is divided by mode: CW on 1.81–1.90 MHz, and CW and SSB on 1.90–1.95 MHz. On 10.1 MHz are amateurs licensed to work CW and RTTY, with RTTY on the last 10 MHz of the band. As of January, 1985, 18.1 and 24.9 MHz will open.

Journal Funkamateur (number 7/1983) brought information about the USSR. In 33 thousand club stations are half a million having an interest in an amateur activity, with 2150 champions active on internal USSR QSOs and 58 champions active on international QSOs.

Number 8/1983 *Journal* reported results of the first SNERA competition in the USSR. (SNERA contributes to scientific perceptions of polar radiances and their influence on UHF.) The winner was UA3MBJ with 1716 points; second was UR2ROT with 1616 points; UR2RIW had 1239 points. The best club station was UK9CAM with 365 points, and one SWL, UA3-142-198, had 221 points.

Every year, at least one world record in the 10 GHz band is the aim of Nicola I9SNY, Perrugia, Italy. Last year, in July, Nicola was in the Ceuta (EA9) and was reached as callsign I9SNY/EA9, in location XV04c, by station IW0BCU/IT9, Sicily, in location GY84c, a distance of 1621 kilometers, for a world record in the 10-GHz band. Nicola repeated his contact with station I9NLK/IT9 of that same location. On the same day, three hours later at 1912 UTC, Nicola surmounted that world record by contacting station Pietro I0YLI/IE9 on Ustica Island (north of Sicily), location GY28b, a distance of 1863 kilometers.

Nicola also reached a new European record on 1296 MHz with his contact with station I8TUS/8. Operator Salvatore was worked in south Italy at location IZ41n. The distance was 1914 kilometers, beating the old European record of 1577 kilometers between OK2BFH/P and G3AUS on October 30, 1982.

Thanks for information and letters from W2HAE, W4NBZ, and WA0HWH, but I cannot send back letters—I am very QRL.

de RK, OK3KFO

MARCH, 1984

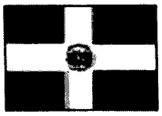
Traditionally, the month of March is devoted to the activities of YL operators in OK. This is in connection with the International Day of Women, March 8, celebrated in OK as well as in all socialist countries.

The March issue of *Amaterske Radio* (usually designated as AR) brings the story of the first YL operator in Czechoslovakia. She was Jarmila Hermanova from Talc in Moravia, and during the period 1929 to 1931, she worked under the callsign OK2AJ. The first Moravian hams, OK2AG and OK2AC, initiated her into amateur radio.

Daughter of the director of a local power plant, she was successful at the exam in 1931 and was offered a bouquet of roses by the president of the examination commission (Ministry of P and T), Dr. Burda. In 1933, her callsign was changed to OK1YL. Her equipment was confiscated on March 18, 1939, during the Nazi occupation. She passed away in 1971, in Zirovnice.

The *Radio Amateur's Messenger* for February, 1984, brings more news concerning YL operators. In fact, since the end of 1983, Jozina Zahoutova OK1FDL has been the president of the Central Radio Club. Her husband and their two children are also active hams. They live in Pribram. Let me here send best wishes of peace and happiness to all YL ops from OK land, where we have grown from one YL in 1929 to over 150 today.

de OK1WI



DOMINICAN REPUBLIC

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THE TWINS AGAIN

Radio Club Dominicano has just elected a new directing board headed by Cesar Dessangles HI8CQ, twin brother of Ernesto HI8CW (former RCD president in 1977). They are the sons of Roberto Dessangles HI8RD who was himself president in 1976.

The great work done by the twins in 1976 helping their father, and then in 1977 during Ernesto's presidency, makes us anticipate a successful performance in 1984.

The advantage of the twins, when either one of them occupies the presidency, is that RCD really has two presidents in one, sharing the work and keeping the club and its membership constantly progressive.

Anyone who doesn't know them well will find it difficult to tell one from the other—and there you can be talking to the wrong one, who's not the president, to deal with some club subject, but it doesn't matter . . . since either will do. Nevertheless, if you want to make sure, just lift up his shirt and you'll find on Cesar's abdomen a scar that Ernesto doesn't have.

The twins are popular in Dominican ham radio, and when they stay away from radio equipment, it's just due to their professional work as architect-engineers which occasionally takes them to other cities around the island.

Just as in 1976–77 the Dessangles' directing board developed a team working plan that was remarkable, a replay is now expected, with the help of the other members of the board and of all the membership in Radio Club Dominicano, Inc.—the most prestigious institution of Dominican Republic ham radio.

Other board members are Eduardo Hued HI8EJH, vice-president; Charlie Catheline HI8CCB, secretary; Tony Lake HI8GAL, treasurer; and Waldo Pons HI8WPC, Wil-

From left to right: Cesar HI8CQ, Tim HI8MFP, and Ernesto HI8CW.

liam Read HI8WRE, Frank Caraballo HI8FCN, Osvaldo Castillo HI8OCB, and Winston Vargas HI8KW.

Immediate plans are for the contests of the Republic Restoration and the Radio Club Dominicano Anniversary. Dates will be given in the near future, as well as information on CW classes and equipment operation procedures for new ham-radio operators.

The twins and the board would like to set up new antennas for the club, organize a work laboratory, and, of course, as a well-established tradition, organize the popular DXpeditions to Saona Island in zone HI2, which always gives rise to much activity and great fun.

I want to thank our readers for all the letters and notes on the *73* international section. I have answered them personally, trying to help them out.

Soon I hope to have an interesting column about the important reasons why HI QSLs are either not getting here on time or just don't get here at all!

FEDERAL REPUBLIC OF GERMANY

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Federal Republic of Germany

QCWA IN DL

In April, 1983, the managing board of the Quarter Century Wireless Association (QCWA) elected Jean Wolff LX1JW to be a member of the Hall of Fame. Jean is the fourth QCWA member and the first European to be thus honored. One has to consider that only one member out of 10,000 QCWAers is chosen per year. For the German chapter and all the radio amateurs in Europe, a very good success.

Together with OOTC, SOWP, and the promoting association, "Foerderverein Amateurfunkmuseum e.V." (Society for Promotion of an Amateur-Radio Museum), we managed a stand at the "Ham Radio 1983" (largest national amateur-radio fair) in Friedrichshafen/Bodensee. Many visitors showed great interest in our stand and did quite a lot of eyeball QSOs. Saturday night, our meeting took place in the administration building. We met again a week later, June 24, 1983, in Waldrach, in the area of Trier, and on Sunday we had an enjoyable trip to Luxembourg, including a sightseeing tour, LX1JW being our tour guide.

After the sightseeing, we drank a bit of champagne with LX1JW in his QTH—about 100 people were participating in this "small" party. We were very interested in the station equipment and admired the 21 antennas. After having a nice lunch and after a visit to a wine coop, we took a beautiful trip on a steamship on the Moselle under excellent weather conditions. We returned to Waldrach and spent the evening with interesting conversations.

Our guests from the USA were: Charles W4SVB with his XYL Peg, Bill KD4ZY with his XYL from Chapter 107, Gene W5EJT, with his XYL Ruth, and K5OPT from Chapter 37. W4SVB presented to the German chapter a nice plaque from Chapter 107. After a sightseeing tour to Trier the next day, we returned to our homes.

On September 6, 1983, about 25 amateurs and their XYLs met at the QTH of DL7AC. LX1JW was honored to receive a plaque from W5KL, vice-president of QCWA. The event was recorded by the broadcast station, "Deutschlandfunk." Later we did QSY to a restaurant, where we spent the whole night.

When the vote to the QCWA board in the USA took place, DL3ME was reelected as director. Out of 15 directors, he was voted into the 4th position. The votes in the German chapter are also finished. The previous managing board was confirmed. The German chapter now starts its seventh year.

70-CM MOONBOUNCE (EME)

On June 13, 1964, just 20 years ago, a group of radio amateurs around HB9RG happened to do the very first 70-cm transatlantic QSO with KP4. The 1000-foot parabolic reflector, gain at 70-cm, 50 dB, which was used by KP4BPZ, had led to this spectacular success. The group (DL9GU, DL3NQ, DJ4AU, DJ3EN) utilized "only" 500 Watts rf, a 5m dish, and an rx with tubes (7 dB). The signals: gain up to 15 dB signal-to-noise ratio. For the group this surely was a great success.

One year later, on July 3, 1965, DJ4AU with his 80-element group antenna, rx input with EC88 and 4CX250 PA—was capable of exchanging 559 reports via the moon with KP4BPZ. Also the first SSB QSOs were worked. Such well-known calls as DL3YBA (4 x 22-element yagis) participated in this action.

On July 24, 1965, KP4BPZ was worked again in CW and SSB by DL stations DL6IQ and DL1EI. Here the equipment was relatively simple also—a 36-element group, rx input with 416B and "only" 200 Watts rf.

Some years have passed now, and with better receivers (GaAsFET) it has become quite a lot easier working EME successfully on 432 MHz. Nowadays, almost 20 radio amateurs in DL are active in this mode. In 1983, the opportunity existed for almost everybody to work via moonbounce.

Radio astronomy was "born" back in 1933, on April 27. Working with international radio communications, Karl Jansky (1905-1950) found a disturbing noise received by the experimental antenna. Jansky came to the conclusion that this noise came from space. The radio emissions of our Milky Way system were discovered. In memory of Janksy, the president of AMSAT-USA, W3IMI, and K8HUH put into operation an antenna of the Greenbank Radio Telescope on 432-MHz EME. After a short echo test, the first station was reached on May 13, 1983—DJ9DL in CW with a 559 report at 1910 UTC. This was followed by DF7VX at 1950 UTC, also with 559 on both sides.

For Europe the moon now set, and the next QSO in DL took place on May 14. Jan DL9KR exchanged 57 in SSB with K8HUH at 1202 UTC. Then the QSOs increased rapidly: 1240—DJ8QL 559/579 in CW, 1300—DF9CY 449/449, 1334—DF3RU 559/579, 1344—DF9AS 55/56 in SSB, 1347—DJ5VI 55/57, 1355—DL6NAA 55/55, 1506—DC9RH 44/44, 1653—DJ6MB 559/559 in CW, 1658—DF7KB 559/559 (his very first EME QSO), 1920—DL1BP 43/53 in SSB, 2017—DJ7YP R0/R0. On May 15, DF9CY started at 1330 with 449/559, DL6WU at 1432 with 449/469, and DL9KR made an SSB demonstration for visitors at K8HUH around 1450. Then, 1616—DK5AI 549/559 in CW, 1710—DK1PZ 449/449, 1723—DL2CJ 449/449, 2037—DK3YC 339/419, 2109—DF3EE 549/419, and for the last DL station, DJ9BV 239/R0.

In this list some well-known calls are missing, but on the other side, some amateurs worked their first EME QSO with relatively simple equipment. DF3EE: only 4 antennas and 250 Watts, DJ7UP: a 21-element Tonna and 400 Watts rf, and JA0CC: 4 antennas and only 40 Watts.

It was suggested that the information about the NRAO-K8HUH 432 EME test was received only by insiders. Otherwise, certainly much more activity would have taken place. The station equipment of K8HUH, a mirror of the interferometer with a diameter of 43 meters and a wideband cross dipole (250-500 MHz) in the focus of the mirror, was used for antennas. The focus is located 18m away from the mirror itself. Also, the 150-Watt transistorized PA and the GaAsFET preamplifier are installed here; these were controlled by different sets, such as MM432/28, IC451, IC720, or Drake R4B. Their own echoes had been heard 59.

In the time period of May 13 to 16, 1983, 132 different stations were worked in 250 QSOs. One time Africa, 6 times Asia, 67 times Europe, 54 times North America, 1 time South America, and 3 times Oceania. Besides, the "WAC 432 MHz" could be worked during these 35 hours.

OJ0MA IN RTTY

Market Reef was QRV in RTTY for several days in June, 1983. OP Kee OH0NA reported: Maerkets Fyr (Market Reef) is situated in the Baltic Sea between Sweden and the Aland Islands. The reef measures about 85 by 310 meters and is about 3 meters above sea level. Three "cottages" were placed on the bare rock: a depository for wood and oil, another for engines and tanks for oil and gas, and finally a small house with six rooms and a kitchen.

That year (1983) the station consisted of a Drake TR-7/RV-7, an Alpha 374, and a "Telereader." Antennas used: a TH3MK3 for 20 meters on a 15m-high, solid-concrete mast, a 2-element beam for 40m, dipoles for 80 and 160m, and a GPA for 40/20/15 and 10 meters.

Some hints now for ops and visitors to Market Reef: Every licensed visitor can get a transmitting permission if the "Alands Lotsfoerdelning" (pilotage service) agrees with the tour to Market Reef. This agreement includes the providing of food. It's only a 25-kilometer trip between Aland and the Reef, but sometimes it's very hard to land on the rocky coast. Last year we had to wait 4 days to come through; this time it was OK the first day. If you want further information, please contact Karl-Erik Eriksson, SF-22430 Saltvik, Finland. That's the QSL address, too.

de DJ8BT

ATOMIC CLOCKS

Can you think of a moderately-priced clock in your ham shack which shows local time accurate to 1 ms, date and day of the week, and which automatically adapts to the changes of summer/winter time and leap years? Which synchronizes itself within 2 minutes after a power break? And which has a long-term stability of 1 second in 300,000 years?

This is no dream for German radio amateurs anymore since a whole range of appropriate clocks is on the market. Prices range from 300-400 DM (115-150 US dollars) for complete units. Examples are the Renkforce atomic-clock system ACS-77, the DCF77 atomic clock made by Schwille-Elektronik (PO Box 801609, 8000 Muenchen 80), and the Hopf atomic clock 4300 (distributed by Conrad Elektronik, PO Box 1180, 8452 Hirschau).

In addition, the radio amateur can take advantage of another feature of these clocks. All of them have a receiver which picks up the required time signals on a frequency of 77.5 kHz. This transmission is controlled by the Physikalisch Technische Bundesanstalt in Braunschweig, Germany, which is an institution comparable to the National Bureau of Standards in other countries. The emission on 77.5 kHz has a frequency stability of 0.001 ppm within a period of 10 seconds and a much higher stability on the order of 0.000001 ppm for extended periods of time.

It is relatively easy to synchronize a 10-MHz crystal oscillator with this 77.5-kHz signal. Tests have shown that by this technique, a low-cost 10-MHz reference frequency signal can be generated with an accuracy of at least 0.001 ppm. It can be used as a solid basis for accurate frequency synthesizers, for frequency dividers to be used for transceiver calibration, for the synchronization of the crystal oscillator in frequency counters to improve their accuracy and long-term stability, and for numerous other applications. (Construction articles for the DCF77-controlled clock appeared in Reference 1 below and for a DCF77-controlled 10-MHz frequency standard in Reference 2.)

All these features are made possible by a special service of the PTB. According to the definition that 1 second equals 9,192,631,770 periods of a specific radiation of the nucleons of 133Cs, PTB utilizes this standard in its atomic clock CS1, which generates highly accurate time and frequency signals. The time signals are encoded and transmitted by station DCF77 near Frankfurt/Main on 77.5 kHz. Both the time signals and the transmitter frequency are controlled by CS1. The transmission of

DCF77 can be heard in an area of about 600 kilometers around Frankfurt/Main, i.e., in most parts of Germany.

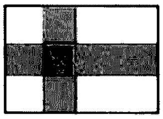
The signals of DCF77 can be picked up by a simple loop or ferrite antenna. After filtering and amplification, they are decoded to obtain the date and time information which can be displayed. Furthermore, the carrier of DCF77 can be amplified and utilized directly to synchronize other signal generators as discussed earlier. If DCF77 cannot be heard, a very similar but more commonly-available technique to produce precise reference signals on the basis of AM broadcast transmissions is described in Reference 3.

The German radio amateurs are only a small but nevertheless grateful portion of all consumers of the DCF77 time and frequency signals. In the meantime, PTB controls by means of DCF77 the clocks and transmission frequencies of broadcast and TV stations, the time announcements on the telephone, the clocks of railway stations, and meteorological services, to name a few. Altogether, the atomic clock and the time and frequency signals derived from it play an important but often unnoticed role in the lives of almost everyone here. For ham radio, however, I think it is a particular challenge to make even better use of it in the future.

de DJ3NW

References

1. Mueller, O., "Einfacher, batteriebetriebener Messempfaenger fuer DCF77," *CQ-DL Magazine*, August, 1979, pp 359–363.
2. Schneider, M., Gusek, B., "DCF77-gesteuerte Zeitbasis mit geregeltem Empfaenger," *CQ-DL Magazine*, July, 1980, pp. 308–310.
3. Beyer, R., "More Stable than a Rock," *73*, July, 1983, pp. 32–40.



FINLAND

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70101 Kuopio 10
Finland

Location NW19 H, Kuopio—not exactly in the middle of the world but almost in the middle of Finland—is the spot where the 25th summer happening of the Finnish Radio Amateurs Association, HAMSSI 84, will take place July 19–22, 1984. The happening will be organized by Kuopion Seitoset, the local club for radio amateurs—which will be 30 years old this year.

HAMSSI 84 will be a happening for the whole family, and the organizers are expecting participants from several countries. The program consists of, among other things, the Nordic Championship of radio orientation, pileup contest, a photograph exhibition which is composed of the harvest of a contest on the subject "Radio Amateurs," lectures on various subjects such as "Satellites and Radio Amateurs," DX dinner, YL meeting, old-timers meeting, and the biggest flea market in Finland. The members of the family have also been taken into consideration by arranging a cruise by ship, city sight-seeing tours, and, especially for children, there are puppet shows, pony riding, games, and playing. A detailed program will be sent when requested.

The event will take place in Rauhalahti, an area which is situated only 5 km to the south of the center of Kuopio. In the area there is a new modern camping site with beaches and saunas on the shore of Lake Kallavesi, a high-class hotel, and a group of buildings belonging to a mansion which will serve as the center of the whole summer event.

The town of Kuopio is situated in the largest lake district of Europe. There are 76,000 inhabitants in the town, which is the center of tourism, administration, and culture for the whole eastern part of Finland. There are lots of things to see and experience in Kuopio. The beating heart of Kuopio is the marketplace—a lively meeting place of international tourism. There are five interesting museums in the town; the Finnish Orthodox Church Museum is the only one of its kind in western Europe. There are eleven hotels, two summer hotels, and two youth hostels in Kuopio. The town also is the center of Finnish inlake boat traffic: There are eight passenger ships departing from the harbor of Kuopio daily. Everyone surely can find something to his taste!

Radio amateurs throughout the world now have, within the framework of their hobby, an excellent opportunity to come to Finland to take part in an international camp. It is organized in the middle of summer when Finnish nature is at its best: The sun hardly sets during the nighttime, the district is, to a great extent, uninhabited, the tens of thousands of lakes inveigle you into cruising, and the green forests invite you to rove on paths. You have an excellent opportunity to get yourself acquainted with this beautiful Scandinavian country, its capital, Helsinki, and the hills of Lapland to the north of the Arctic circle, before or after the camp.

The boat and flight connections from Europe to Finland are good. Those participants who are coming from further away are advised to collect small groups and make use of the advantageous group prices of the airway companies. Contact your own club in order to be able to come to Kuopio. There is room at the camping site, but it is wise to make all other reservations for accommodation, as well as the reservations for flights and ships, in good time.

Hamconvention topics and activities will include Operating VHF/UHF in Modern Environments, Towards Gigahertz, Antennas, DX Operations Today, a Contest Forum, SSTV/ATV/RTTY, the DX Dinner, Nordic and Finnish Championship in Foxhunting and YOU too, CW competition: Amateurs against Defense Forces, Police, and Association of Finnish Radio Telegraphists, Electric Security in Ham Radio, New Technology used in Ham-Radio Equipment, and Amateurs and the Microcomputer.

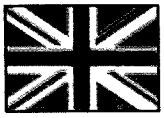
We have a foreign-visitor manager who will be very glad to help and guide you during your visit to HAMSSI 84, and main topics will be interpreted in English.

Kuopio is about 450 km northeast of Helsinki with good rail, road, and air connections. Accommodations can be arranged at the first-class Rauhalahti hotel or the campsite nearby. The Rauhalahti campsite is situated about 5 km from the center of the town. It is modern and well equipped: cafe, kiosk, beach, 4 saunas, rowing boats, modern shower and washrooms, and parking areas for cars and caravans.

Campsite reservation: Kuopio Tourist Service, Haapaniemenkatu 17, SF 70100 Kuopio, Finland, Tel. +358-71-114101, Telex 42163 ktour sf.

Hotel reservation (preferably before May 30, 1984): Hotel Rauhalahti, Katiskaniementie 2, SF 70700 Kuopio, Finland, Tel. +358-71-311700, Telex 42242 rauha sf.

Further information: Mr. Joxa Hartikainen, OH 7 00, Kauppakatu 45, SF 70100 Kuopio, Finland, Tel. +358-71-124311, Telex 42138 carls sf.



GREAT BRITAIN

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Cheshire
England

One of the most rewarding spin-offs from writing a column such as this is the receipt of letters and cards from readers. Since writing for *73*, I have received all sorts of requests and snippets of information not only from readers in the United States, but also from Africa, Asia, and Australia. Usually I try to put together a personal reply and write directly to the correspondent. A recent QSL card, however, prompted me to put together this particular column.

Ron Johnson WA5RON of Silver Creek, Texas, wrote asking for information about our 4-meter (70-MHz) allocation. I had not previously used this as a topic because I did not think anyone would be interested in a VHF band to which they did not have access. Ron's letter, though, suggested that US hams would find details of 4 meters of interest and he asked a number of pertinent questions.

The 4-meter band is spelled out in the UK license as follows. The band coverage is 70.025–70.5 MHz with usage being on a secondary basis (some military systems use 70 MHz and have priority at all times). The maximum allowable power is 50 Watts dc input (or, in Department of Trade and Industry terminology, "133.33 Watts Radio Frequency Peak Envelope Power").

Allowable modes on 4 meters are AM (including CW, of course), SSB, and FM. Although 70 MHz is classed as a VHF band, only class A license holders have access. VHF-only class B licensees (i.e., those who have not passed a code test) cannot use any band below 144 MHz. Needless to say, this restriction is viewed by some as rather pointless—its major impact is to reduce the number of potential users of the band.

As with all VHF bands in IARU Region One (Europe and Africa), there is a band plan for use of 4 meters (like the others, it is a voluntary plan but, nevertheless, is mostly adhered to). The plan seeks to separate the non-compatible modes (i.e., SSB and FM) whilst giving everyone a fair share of the available spectrum.

The 4-meter band plan is as follows:
70.025—Beacons only
70.075—CW only
70.150—SSB and CW only
70.200—SBB calling
70.260—All modes
70.300—RTTY calling
70.400—FM simplex
70.450—FM calling
70.500—end of band

Current 70 MHz beacons with power and beam heading are:
GB3CTC (70.300)—40 W, 45°
GB3WHA (70.040)—16 W, 315°
GB3BUX (70.080)—20 W, Omni
GB3ANG (70.060)—100 W, 160°

There are currently no repeaters operating in the 70 MHz band.

There are only two other countries with allocations in the 4-meter region. These are Gibraltar (ZB2) and Eire (EI). The opportunities for DX are correspondingly rare, therefore, although there have been reports of crossband contacts (70/144 MHz, 70/28 MHz, and, recently, 70/50 MHz) with Faroes (TF), Madeira (CT2), and Sweden (SM).

Despite low occupancy rates, 70 MHz does boast some of the less usual propagation modes with meteor scatter, auroral, and sporadic-E all featuring. Incidentally, the record distance for the last-mentioned mode is 745 km. Sporadic-E is also responsible for the frequent appearance in the UK of beacons ZB2VHF and EI4RFF (70.130 MHz).

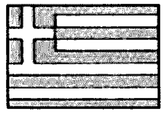
Perhaps the most endearing feature of the 4-meter band is its quietness and lack of crowding relative to 2 meters. This also can mean long periods when CQ calls remain unanswered.

There is little commercial equipment available for 70 MHz, with those few advertised items being of UK origin. (I have never seen any Japanese 4-meter gear advertised). Metalfayre of Dover produces 4-meter antennas with a 3-element version (7 dB gain) available at $40.00 and a 5-element version (9 dB gain) available at $64.00.

Wood and Douglas produces a range of 70-MHz modules that can form the basis of a home-brew rig. These include a 1.5-W transmitter ($50.00 assembled, $30.00 kit), an FM receiver ($90.00 assembled, $62.00 kit), and a couple of preamplifiers.

It is unlikely that 4-meter occupancy will increase significantly until the band is opened to class B license holders or more countries adopt an allocation in this part of the spectrum. Neither of these seems likely at present.

An interesting aside has just come to my attention via the RSGB hotline news service (a telephone answering machine at RSGB headquarters). British Telecom has just closed down its cable television service in Milton Keynes because they were unable to prevent egress of a 144-MHz signal. The Department of Trade and Industry will not permit the service to reopen until a new carrier frequency is implemented. Well, well!



GREECE

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Athens 11210
Greece

Now that the summer's here, maybe it is time for planning your annual vacation. Well, if blue sky, clear sea, and long sandy beaches appeal to you, then Greece is the place for you. You may also keep in mind that Greece has a lot to offer to a radio amateur, such as four separate DXCC countries to work from. These countries are mainland Greece (SV), Crete (SV9), Dodecanese Islands (SV5), and Mt. Athos (SV/A). Even if we have to leave the last one (hard to obtain a license), there are still the three to work from.

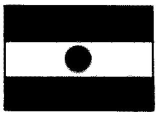
Things are much better now than they used to be a few years ago, and people have started to understand a bit more about amateur radio. There are many places such as hotels, bungalows, etc., where the owners allow an antenna to be erected and also will provide any help needed. I remember once, four years ago, while on vacation on the island of Cos (Dodecanese Islands), two people were fighting about who would have the privilege of having our antenna on top of his house!

So, do consider Greece as a possible place for your next vacation and don't forget to bring along your amateur gear, un-

less you have to choose between the radio and the XYL...

By the way, don't be surprised if you hear on the air a J4 prefix instead of the regular SV. Greece is issuing this prefix on special occasions, like contests, celebrations, etc.

Finally, we have two more countries that now have a reciprocal agreement with Greece. These are Sweden and the Federal Republic of Germany which, along with Cyprus, the USA, and Canada, make a total of five.



INDIA

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India

THE GOLD RUSH

DXpeditions still pay—especially when they are next door. DXpeditions have always had their own special kind of charm—not just the spirit of adventure, but also the fragrance of greenbacks. With a large number of affluent amateurs looking for more contacts to complete their single-band/multiband DXCC, a number of standardized methods to promote DXpeditions have evolved over the past two decades.

It began with the loan of equipment, money, and manpower to the local amateurs. One or two of the sponsors, mainly from the US, would try to join in as members, although the leader would be an Indian. The beams were given as a gift after the event because they would cost more than their original cost to take back. The QSL manager to the expedition was generally one of the sponsors—so that's where the greenbacks ultimately landed.

With the natives getting wiser, they began organizing their own expeditions with equipment donated by foreign sponsoring groups. The ostensible purpose was to give the world contacts with a rare country. The resulting greenbacks now came into their hands and mostly covered their costs, but did not compensate for all the backaches and tribulations of the travel.

The latest revolution in equipment design has now made it possible for expeditions to be more cost-effective by making multiband/multi-operator, round-the-clock operation possible with simple hand-carried power sources. Indians have not been too slow in catching up with this advantage.

Two regions of India that have enjoyed separate country status for quite a long time are the Andaman-Nicobar Islands and the Laccadive Islands. They have always been targets for these promoters. And, luckily for country-hunters, that status has continued long after these islands became integral parts of VU-land. There was a move to do away with special callsigns for these areas, but the Federation of Amateur Radio Societies of India (FARSI) President M. V. Chauhan VU2MV pointed out to the government the need to continue special callsigns for these areas—advice which obviously was heeded.

Late in 1983, with barely a few weeks to go, the government decided to celebrate WCY with a general permission to all comers to operate for a 15-day period up to December 31, 1983, from the Laccadive Islands, 250 miles off the west coast of India. Every station would use VU7WCY suffixed by his own call letters. The first team of two men and a YL left promptly and claimed over 5000 contacts in CW/SSB modes. A one-man expedition followed before the year was out. Bowing to pressures, the Wireless Planning and Coordination Wing of the Ministry of Communications (India's FCC) extended the deadline to March 31, 1984, paving the way for one more team to raise the tally by a further 5000 contacts.

The dollars and IRCs have begun rolling in, and each team has begun responding to the QSLs that are flooding in. When the gold rush is over, it will be time for the expeditioners to reckon how worthwhile the trek to the west was!

IRAQ

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During my last trip to Baghdad, I was privileged to be a guest at YI1BGD (Scientific Center, Box 5864, Baghdad) and to take photographs. I have fortunately been able to visit the station several times and I want others to understand some of the problems faced by the club in Baghdad.

To guarantee a QSL card, you must send three IRCs *dated after 1 July 1981*. The date is very important because ones issued prior to 1 July 1981 are not valid in Iraq. A self-addressed envelope and of course your card should also be sent.

The letter to YI1BGD should be addressed to the operator *but should not have a callsign* in the address. Do not send any money; it will not get to the club.

The club promises that any QSL cards received will be acknowledged, but everyone needs to understand that over 500 cards a month are received, of which 50% have IRCs and a return envelope, 20% have only IRCs, and 30% have no IRCs and no envelope. The club presently has over 2000 IRCs that are not valid in Iraq and cannot be used to defray the cost of QSLing.

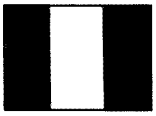
The club is supported entirely by the 6 operators, and just the cost of postage for a one-year period is staggering. As a last resort, the club will send QSLs to the respective bureaus in each country, but this process can sometimes take up to 12 months to complete.

You might also be interested to know where all the club equipment comes from. The Drake C line was donated by JY1, His Majesty King Hussein of the Hashemite Kingdom of Jordan. The Atlas 210 was donated by the Radio Amateur Society of Yugoslavia. The Yaesu FT-101E was donated by JA1BK, the keyer by DL6QW, and the triband antenna and rotator were donated by the Northern California DX Association through OH2BH and the Radio Amateur Society of Finland.

The special call of YI1BIF was used November 3-20 to celebrate the Baghdad International Trade Fair.

JY9IU/HB9AIU and I assisted in setting up the station. Over 2000 contacts were made, and most QSLs should be answered by now.

YI1BGD is usually on the Arabian Knight Net at 0500 GMT two days a week and, if possible, every morning at 0500 to 0700 GMT on the Rare DX Net headed by JY3ZH. If time and operators permit, they are also on from 1500 to 1700 GMT Monday and Wednesday.



ITALY

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Italy

THE ITALIAN AFFAIR

I excuse myself with the readers not being able to write from Italy last month due to several reasons, the main of which is the effort spent with discussions and actions with other fellows directed to defend our rights and to restore our privileges at the same level as the other European countries.

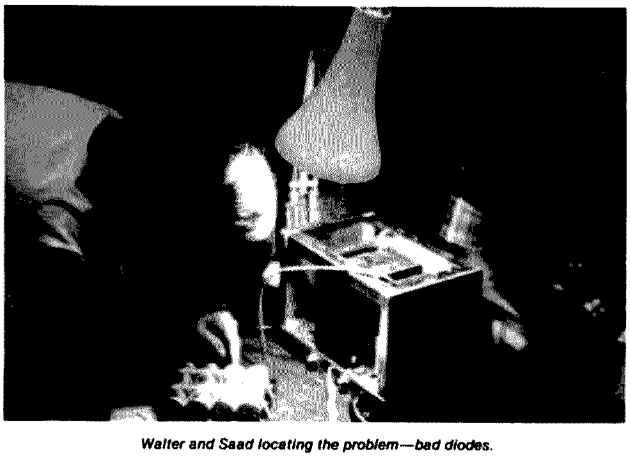
I have already explained what happened here in Italy: fines and license suspensions for amateurs who were found outside the borders of an ancient and outdated law and regulation. So much has happened during the last two months on this matter, and the situation, although improved, is still fluid. I will not now tell the story, which seems to be still susceptible to further development.

Nevertheless, the most important thing

Continued on page 102

Majied at the club station.

From the left: Walter Hediger, Herb Perkins, and Saad (operator at YI1BGD) repairing a dead L4B power supply.



Walter and Saad locating the problem—bad diodes.

Random VIC

Code-loving Commodore addicts asked for this. Ye shall receive.

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Ogden UT 84404

For those of you who don't know who or what the VIC-20 is, it is the low-cost micro from Commodore, the makers of the Pet microcomputer. The VIC-20 is built around the 6502 chip and comes from the factory with 5K of memory, of which 3583 bytes are RAM. The VIC-20 can be expanded to 32K by the addition of memory expanders. The memory-expander cartridges can be plugged into the back of the VIC through the expansion port. They come in 3K, 8K, and 16K sizes and can be used alone or all together with a mother board to give you a total of 32K.

The VIC also has interface cartridges which can be plugged into the back of the user port. The VIC will interface through an RS-232 cartridge, an IEEE-488 cartridge, or through a phone modem. I have used the VIC phone modem to plug into one of the many computer services and it works very well. The phone modem comes with the necessary software to turn the VIC into a terminal. As of yet, I have not used the VIC for RTTY or ASCII over the ham bands.

Data or program storage can be saved on the VIC floppy disk or the VIC cassette drive. Also available for the VIC-20 is the VIC printer. It can be used to list programs, or the contents of the screen can be sent to the printer.

The VIC comes with all the necessary cord and filters so that the home TV can be used for the video display, or a color monitor can be used with no external interfacing. The screen size is 22 columns by 22 rows which sometimes can be an inconvenience. The Commodore people say there is a cartridge, the

Program listing.

```
1 PRINT"■■■■■■CODE PRACTICE PROGRAM"
2 PRINT"■■■"SPC(9)"BY":PRINTSPC(4)"■■EUGENE MORGAN":PRINT"■■■■ (C) COPYRIGHT 198
2"
3 FORT=1TO2000:NEXT
4 POKE36878,15:GOTO19:REM TURN ON SOUND
5 POKEA,B:FORT=1TOZ%:NEXT:POKEA,0:FORT=1TOT%:NEXT:RETURN:REM DAH
6 POKEA,B:FORT=1TOT%:NEXT:POKEA,0:FORT=1TOT%:NEXT:RETURN:REM DIT
7 FORT=1TOS%:NEXT:RETURN
19 PRINT"■  ■TO STOP PROGRAM HIT■          ■ANY KEY■":PRINT"■(BE SURE TO TURN UP
  SOUND)"
20 PRINT"■■■■WHAT SPEED?":PRINT"5...WPM":PRINT"10..WPM":PRINT"15..WPM":PRINT"20.
.WPM"
21 PRINT"■25..WPM":PRINT"30..WPM":PRINT"35..WPM"
22 A=36875:B=240:REM PITCH OF TONE
25 INPUTW%:REM SPEED
26 IFW%=5THENT%=180:GOTO40
27 IFW%=10THENT%=90:GOTO40
28 IFW%=15THENT%=68:GOTO40
29 IFW%=20THENT%=45:GOTO40
30 IFW%=25THENT%=40:GOTO40
31 IFW%=30THENT%=34:GOTO40
32 IFW%=35THENT%=28:GOTO40
40 Z%=T%*3:S%=T%:PRINT"■■"SPC(5)W%" WPM.■"
49 V%=0:N%=1
50 FORT=1TOT%:NEXT
51 GOSUB850
60 IFA$="A"THENGOSUB6:GOSUB5:GOTO150
61 IFA$="B"THENGOSUB5:GOSUB6:GOSUB6:GOSUB6:GOTO150
62 IFA$="C"THENGOSUB5:GOSUB6:GOSUB5:GOSUB6:GOTO150
63 IFA$="D"THENGOSUB5:GOSUB6:GOSUB6:GOTO150
64 IFA$="E"THENGOSUB6:GOTO150
65 IFA$="F"THENGOSUB6:GOSUB6:GOSUB5:GOSUB6:GOTO150
66 IFA$="G"THENGOSUB5:GOSUB5:GOSUB6:GOTO150
67 IFA$="H"THENGOSUB6:GOSUB6:GOSUB6:GOSUB6:GOTO150
68 IFA$="I"THENGOSUB6:GOSUB6:GOTO150
69 IFA$="J"THENGOSUB6:GOSUB5:GOSUB5:GOSUB5:GOTO150
70 IFA$="K"THENGOSUB5:GOSUB6:GOSUB5:GOTO150
71 IFA$="L"THENGOSUB6:GOSUB5:GOSUB6:GOSUB6:GOTO150
72 IFA$="M"THENGOSUB5:GOSUB5:GOTO150
73 IFA$="N"THENGOSUB5:GOSUB6:GOTO150
74 IFA$="O"THENGOSUB5:GOSUB5:GOSUB5:GOTO150
75 IFA$="P"THENGOSUB6:GOSUB5:GOSUB5:GOSUB6:GOTO150
76 IFA$="Q"THENGOSUB5:GOSUB5:GOSUB6:GOSUB5:GOTO150
77 IFA$="R"THENGOSUB6:GOSUB5:GOSUB6:GOTO150
```

Victerm-40, that gives the VIC a 40 by 22 screen. As of this writing, I have not used it.

The VIC-20 can be programmed in Basic or machine language. It is very easy to mix Basic and machine language together in a program by the use of a simple command, SYS.

The Program

I chose Basic for the random code-practice program because it would be easy to adapt to other computers and also because speed of execution was not an important factor. No memory expansion is needed to run this program. If you are using expansion cartridges, they should be switched off or removed. This program takes only 2227 bytes.

The code-practice program sends a random code at whatever speed you select. You will be prompted for a sending speed from 5 wpm to 35 wpm in steps of 5. The code sound is made at the same time as the letter is printed on the screen. Printing the symbol at the same time as it is sounded can be very helpful when trying to associate the symbol with the sound.

If you prefer, you can blank out the screen so that you cannot see the symbols being printed until you stop the program. The method for doing this is as follows.

First, when you reach the part of the program that asks you for a speed, type in your selection—but before you press RETURN, change the cursor to white. This is done by pressing the CTRL key and 2 key together. This will make the cursor disappear. Now all symbols will be printed the same color as the screen. In order to see what has been printed on the screen, you must stop the program by pressing any key; then hit the RUN STOP key. Then POKE 36879,8 and the screen will turn back and you will see what has been printed.

To rerun the program, press the RUN STOP key and the RESTORE key together. This will change the screen back to white and go back to the first of the program.

The way the program is set to run is as follows. First, the program gives my information. By pressing any key you move into the program. You will be prompted for a speed. A menu will be printed on the screen for your selection. Enter your choice and press RETURN. The screen will clear and you will hear a code and the symbols will appear on the screen in groups of five. Be sure to turn the volume on.

When you have copied enough, just press any key. The code will stop and you will be asked if you would like to select a new speed. If you do, then just press any key. The screen will clear and you will again be given a selection from 5 wpm to 35 wpm.

The first part of the program, lines 1-3, deals with my information. Line 4 sets the volume on the VIC; 15 is as high as you can go. Lines 5-7 are the Gosubs. I placed the Gosubs at the beginning of the program as a memory-crunch procedure to conserve memory. It would have taken more memory and more typing time if I had used three-digit numbers.

Line 19 is an instruction prompt for halting the program. Lines 20 and 21 print the speed menu. Line 25 asks for your choice. Line 22 sets the pitch of the sounds. You can change the pitch of the Dah and Dit by POKEing 36875 to any value from 128 to 255.

Lines 26 through 32 set the length of T%. T% is used to set the lengths of the Dit, Dah, and the spaces. You can change the speeds by changing the value of T%. Line 40 sets the length of the Dah and Z%. Z% is three times longer than T%. This will make the Dahs three times longer than the Dits. Line 40 also sets the value of S% which is the length of the space between words. S% is four times longer than T%.

Line 50 is the space between each symbol. Lines 60 through 109 are the symbols with the Gosubs to get each Dah and Dit. Line 100 is the blank space between the groups. Line 150 tells the VIC to go back and count to T% and delay between symbols. Line 850 looks to see if

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78 IFA$="S"THENGOSUB6:GOSUB6:GOSUB6:GOTO150
79 IFA$="T"THENGOSUB5:GOTO150
80 IFA$="U"THENGOSUB6:GOSUB6:GOSUB5:GOTO150
81 IFA$="V"THENGOSUB6:GOSUB6:GOSUB6:GOSUB5:GOTO150
82 IFA$="W"THENGOSUB6:GOSUB5:GOSUB5:GOTO150
83 IFA$="X"THENGOSUB5:GOSUB6:GOSUB6:GOSUB5:GOTO150
84 IFA$="Y"THENGOSUB5:GOSUB6:GOSUB5:GOSUB5:GOTO150
85 IFA$="Z"THENGOSUB5:GOSUB5:GOSUB6:GOSUB6:GOTO150
86 IFA$="1"THENGOSUB6:GOSUB5:GOSUB5:GOSUB5:GOSUB5:GOTO150
87 IFA$="2"THENGOSUB6:GOSUB6:GOSUB5:GOSUB5:GOSUB5:GOTO150
88 IFA$="3"THENGOSUB6:GOSUB6:GOSUB6:GOSUB5:GOSUB5:GOTO150
89 IFA$="4"THENGOSUB6:GOSUB6:GOSUB6:GOSUB6:GOSUB5:GOTO150
90 IFA$="5"THENGOSUB6:GOSUB6:GOSUB6:GOSUB6:GOSUB6:GOTO150
91 IFA$="6"THENGOSUB5:GOSUB6:GOSUB6:GOSUB6:GOSUB6:GOTO150
92 IFA$="7"THENGOSUB5:GOSUB5:GOSUB6:GOSUB6:GOSUB6:GOTO150
93 IFA$="8"THENGOSUB5:GOSUB5:GOSUB5:GOSUB6:GOSUB6:GOTO150
94 IFA$="9"THENGOSUB5:GOSUB5:GOSUB5:GOSUB5:GOSUB6:GOTO150
95 IFA$="0"THENGOSUB5:GOSUB5:GOSUB5:GOSUB5:GOSUB5:GOTO150
100 IFA$=CHR$(32)THENFORT=1TOS%:NEXT:GOTO150
101 IFA$="."THENGOSUB6:GOSUB5:GOSUB6:GOSUB5:GOSUB6:GOSUB5:GOTO150
102 IFA$=","THENGOSUB5:GOSUB5:GOSUB6:GOSUB6:GOSUB5:GOSUB5:GOTO150
103 IFA$="?"THENGOSUB6:GOSUB6:GOSUB5:GOSUB5:GOSUB6:GOSUB6:GOTO150
106 IFA$=":"THENGOSUB5:GOSUB5:GOSUB5:GOSUB6:GOSUB6:GOSUB6:GOTO150
107 IFA$=";"THENGOSUB5:GOSUB6:GOSUB5:GOSUB6:GOSUB5:GOSUB6:GOTO150
108 IFA$="/"THENGOSUB5:GOSUB6:GOSUB6:GOSUB5:GOSUB6:GOTO150
109 IFA$="-"THENGOSUB5:GOSUB6:GOSUB6:GOSUB6:GOSUB6:GOSUB5:GOTO150
150 GOTO50
850 GETL$:IFL$=""THEN900
855 IFL$>"0"THEN1200
900 X=INT(RND(1)*90)+1
901 IFX<44THEN900
902 IFX=60THEN900
903 IFX=61THEN900
904 IFX=62THEN900
905 IFX=64THEN900
907 V%=V%+1:N%=N%+1
908 IFV%=6THENX=32:V%=0
909 IFN%=300THEN1300
950 A$=CHR$(X):PRINTA$;:RETURN
1200 PRINT" ▓STOP■":PRINT"▓TO SELECT A NEW SPEED":PRINT"▓HIT ANY KEY.■"
1205 GETJ$:IFJ$=""THEN1205
1210 GOTO19
1300 PRINT"▓▓"SPC(16)"** STOP **":PRINT"   PRESS ANY KEY TO"SPC(9)"CONTINUE.▓"
1305 GETE$:IFE$=""THEN1305
1310 GOTO40

READY.
```

a key has been pressed. If one hasn't been pressed, then the program goes to line 900, at which point a random number between 1 and 90 is generated.

Lines 901 to 905 take care of the numbers that we can't use in our program. Line 907 keeps track of the number of symbols printed since the last space. Line 908 tells the VIC what to do after it has printed five symbols. Line 950 turns our random number into a symbol and then sends the VIC back to line 60 where it will look for the symbol it has just printed. The program will stay in this loop until a key is pressed. If a key is pressed, line 850 will send the VIC to line 1200 where it will stop the code and print an instruction prompt. Line 1205 will wait for you to press a key. If a key is pressed, the VIC will go to line 19. At line 19, the VIC will start the routine to get a new speed.

I have used the random-code program for almost a month now and have improved my speed by ten words a minute. I hope that you will find the practice as helpful as I have. I haven't used this program on any prospective hams yet, but I have made several code tapes from this program and given them to some of my ham friends. So if your friend doesn't have a VIC, he can take advantage of yours.

I have also made other programs for the VIC-20 for use by the amateur-radio operator. The Ham Log is a program that will keep track of your QSOs by call and state or country. Information can be recalled by typing in a call or a state or a country. Any data can be listed for each station you work. Such data could include the operator's name, address, phone, frequency, rig and antenna, or any interesting tidbit you wish. Data can be updated without any hassle.

Antenna Program

Another very useful program is the antenna-design program. All you do is input the type of antenna and its frequency. I have built some of the antennas and found them to work very well. This program could be very useful to the ham who likes to build his own.

Programming Can Be Fun

I have a very good time experimenting with the VIC. Sometimes it can be frustrating when something you thought would work doesn't and nothing you try will work. You have to scrap the idea and try the same thing from another angle. Then when it does work, it can be very satisfying.

The VIC is, at last, a computer that most people can afford (under $300) and it can get you started in the world of computers. At first, the programs can look very strange with all the Gosubs and Gotos, the POKEs and PEEKs, and all of the other computer jargon. But it will surprise you how fast you can pick it up, and you will be writing your own programs in no time at all.

If you are a ham who just doesn't think that you could use a computer, then I am here to tell you that there are many uses for one in the ham shack even if you never use it on the air. I am sure that after you get the hang of programming—and you don't need to be an expert—you will find many other uses for it around the house. One word of caution: it can be addicting!

If you have any questions or some problems with the random code-practice program, please let me know. ■

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

MAPLE RIDGE BC CAN
JUN 30-JUL 1

The Maple Ridge ARC will host Hamfest '84 on June 30-July 1, 1984, at the Maple Ridge Fairgrounds, 30 miles east of Vancouver. The registration fee is $5.00 for hams and $2.00 for non-hams over 12 years old. Features will include a swap and shop, commercial displays, bunny hunts, and ladies' and children's programs. Food and camper space with electricity will be available. Talk-in on 146.20/.80 and 146.34/.94. For more information or preregistration (20% off gate fee), contact Maple Ridge ARC, Box 292, Maple Ridge BC V2X 7G2.

OVERLAND PARK KS
JUL 4-7

The Mobile Amateur Radio Awards Club, Inc., will hold their annual convention from Wednesday to Saturday, July 4-7, 1984, at the Holiday Inn in Overland Park KS. There will be a picnic for early arrivals on Wednesday evening, and on Thursday there will be area tours and a dinner theater. On Friday there will be antenna and computer forums, and on Saturday morning the annual business meeting will be held. The hospitality suite will be open during the entire convention. For more information, send an SASE to R. L. Dyson KØAYO, R1, Box 230 M, De Soto KS 66018.

MAHOPAC NY
JUL 7

The Putnam Emergency Amateur Repeater League (PEARL) will hold its 3rd annual hamfest on Saturday, July 7, 1984, from 9:00 am to 4:00 pm, at St. John's School Monsignor O'Brien Boulevard, Mahopac NY. General admission is $1.00, indoor tables are $5.00 each, and outdoor tailgating is $4.00. Talk-in on 144.535/145.135 and 146.52. For advance registration and more information, contact Frank Konecnik WB2PTP, RD1, 244 C, Carmel NY 10512.

FARIBAULT MN
JUL 7

The Faribault Amateur Radio Club will hold its 3rd annual swapfest on Saturday, July 7, 1984, from 9:00 am to 3:00 pm, at Rice County Fairgrounds, Faribault MN. Tables are available only by reservation before July 1st. Talk-in on 146.19/.79. For more information, contact Mike Ferguson NØDGG at (507)-744-5145 after 5:00 pm.

OAK CREEK WI
JUL 7

The South Milwaukee Amateur Radio Club will hold its annual swapfest on Saturday, July 7, 1984, from 7:00 am to approximately 5:00 pm, at the American Legion Post #434, 9327 South Shepard Avenue, Oak Creek WI 53154. Admission is $3.00 per person and includes a "Happy Hour" with free beverages. Parking, a picnic area, hot and cold sandwiches, and liquid refreshments will be available. There will be free overnight camping. Talk-in on 146.94 MHz FM. For more details, including a local map, write South Milwaukee Amateur Radio Club, PO Box 102, South Milwaukee WI 53172.

INDIANAPOLIS IN
JUL 7-8

The State ARRL Convention and the Indianapolis Hamfest will be held on Saturday and Sunday, July 7-8, 1984, at the Marion County Fairgrounds at the southeastern intersection of I-74 and I-465. Gate tickets are $4.00 and entitle you to free parking and all activities. Flea-market and commercial vendors may set up at 8:00 am on Saturday, July 7th. Security will be provided Saturday night and Sunday, and free camper facilities and hookups will be available on the grounds. The commercial building will be open to the public at 8:00 am on Sunday, July 8th. There will be technical forums all day Sunday, and professional food service will be provided. For further information, contact Indianapolis Hamfest, Box 11086, Indianapolis IN 46201.

ALEXANDER NY
JUL 8

The Genesee Radio Amateurs, Inc., will hold the Batavia Hamfest on Sunday, July 8, 1984, from 7:00 am to 5:00 pm, at the Alexander Firemen's Grounds, Rte. 98, Alexander NY. Admission is $3.00 in advance before June 22, 1984, and $4.00 at the door. The commercial exhibit area will open at 9:00 am and there will be hot-air-balloon rides. Activities will include breakfast at 6:00 am, a CW contest, OM and YL programs, a .52 check-in contest, a flea market, a chicken barbecue, and free camping (electricity is $2.00). Talk-in on 6.52 and 4.71/5.31 (W2RCX). For further information, contact GRAM, PO Box 572, Batavia NY 14020.

BOWLING GREEN OH
JUL 8

The 20th annual Wood County Ham-A-Rama will be held on Sunday, July 8, 1984, beginning at 8:00 am, at the Wood County Fairgrounds, Bowling Green OH. Admission and parking are free. Trunk sales and food will be available. Advance table rentals are $5.00 and are for dealers only. Saturday will be available for setups until 8:00 pm. Talk-in on .52. For more information or dealer rentals, send an SASE to Wood County ARC, c/o Craig Henderson, Box 366, Luckey OH 43443.

SHEBOYGAN WI
JUL 14

The fifth annual Sheboygan County Amateur Radio Club Lakeshore Swapfest and Brat Fry will be held on July 14, 1984, from 10:00 am to 4:00 pm, at the Wilson Town Hall, south of Sheboygan WI. Tables are free and camping is available at Terry Andre State Park. For a flyer and other information, write Julian E. Jetzer KR9S, 6400 Hawthorn Road, Sheboygan WI 53081, or phone (414)-457-3366 after 5:00 pm CDT.

MILTON ONT CAN
JUL 14

The Burlington Amateur Radio Club will host the tenth annual Ontario Hamfest on July 14, 1984, from 7:00 am to 4:00 pm, at the fairgrounds in Milton ONT. Tickets are $2.50 in advance and $4.00 at the gate. Weekend camping, free parking, and free flea-market tables will be available. Features will include indoor commercial displays as well as the traditional events. Talk-in on .21/.81 (club repeater). For more details, contact BARC, PO Box 836, Burlington ONT L7R 3Y7, Canada.

EAU CLAIRE WI
JUL 14

The Eau Claire Amateur Radio Club will hold its annual hamfest on Saturday, July 14, 1984, from 8:00 am to 4:00 pm, at the 4-H buildings in Eau Claire WI. Tickets are $2.00 in advance and $3.00 at the door; tables and coffee are free. Talk-in on .31/.91 and .52 simplex. For more information and tickets, send an SASE to Gene Lieberg KA9DWH, 2840 Saturn Avenue, Eau Claire WI 54703.

AUGUSTA NJ
JUL 14

The Sussex County ARC will sponsor SCARC '84 on Saturday, July 14, 1984, beginning at 8:00 am, at the Sussex County Fairgrounds, Plains Road, off Rte. 206, Augusta NJ. Admission is $2.00. Indoor tables are $5.00 in advance and $6.00 at the door; tailgate space is $4.00 in advance and $5.00 at the gate. There will be food and refreshments and plenty of free parking. Talk-in on .90/.30 and .52 simplex. For further information, write Donald R. Stickle K2OX, Weldon Road, RD #4, Lake Hopatcong NJ 07849, or phone (201)-663-0677.

POUGHKEEPSIE NY
JUL 14

The ARRL Mt. Beacon Hamfest will be held on Saturday, July 14, 1984 from 8:00 am to 3:00 pm, at the Arlington Senior High School, Poughkeepsie/Lagrange, Dutchess County NY. Admission is $2.00 (XYL and your children will be admitted free), tailgating is $3.00 (includes one free admission), and a table space is $4.00 (includes one free table and admission). Hot food, beverages, and free parking will be available. There will be an auction beginning at 2:00 pm. Talk-in on 146.37/.97 and 146.52. For more information, contact Art Holmes WA2TIF, 2 Straub Drive, Pleasant Valley NY 12569, (914)-635-2614, or Walt Sutkowski K2DPL, 61 Robin Road, Poughkeepsie NY 12601, (914)-462-5133.

MANCHESTER NH
JUL 14

The New Hampshire FM Association will sponsor an amateur-radio/electronics flea market on Saturday, July 14, 1984, beginning at 9:00 am, at the Manchester Municipal Airport. The rain date will be July 15, 1984. General admission is $1.00 per person and sellers' admission is $5.00 (bring your own table or tailgate). Commercial displays are welcome. Refreshments will be available. Talk-in on 146.52 FM. For further information, contact Dick DesRosiers W1KGZ at (603)-668-8880 and for pre-registration or more information, write Doug Aiken K1WPM, 30 Meadowglen Drive, Manchester NH 03103, or phone (603)-622-0831.

CHARLESTON SC
JUL 14-15

The Charleston Amateur Radio Society will hold its annual hamfest on July 14-15, 1984, at the Omar Shrine Temple. Talk-in on 146.19/.79. For further information, write Hamfest Committee, PO Box 70341, Charleston Heights SC 29405.

BOISSEVAIN MAN CAN
JUL 14-15

The 21st annual International Hamfest will be held on July 14-15, 1984, at the International Peace Garden between Dunseith ND and Boissevain MAN. Activities

HAM HELP

I need a schematic and manual for my Tempo FMH-2, two-meter HT. I also need a good (unbroken) battery tray for same. Please advise of your costs when replying. Thank you.

Randy W. White KB4ALH
506 Robinhood Drive
Seneca SC 29678

Twenty years ago, I read an article on how to convert a TV to an oscilloscope. I have three old B&W TVs which I'd like to convert to some type of test equipment, but I don't know how. Can anybody help?

Guy Milne W2BPN
32 Stag Trail
Fairfield NJ 07006

I am in desperate need of a 5BP4, 5BP1, or equivalent CRT for my Eico model 425 oscilloscope. Any information on where I can find or purchase one would be greatly appreciated.

Ira Linderman
PO Box 229
Commack NY 11725

I need copies of several pages from the manual for the AN/USM 281A oscilloscope (military version of the Hewlett-Packard HP180). I also need some pages from the service manual for the Motorola Mocom 10.

John Tobin KF4WG
6726 Cocos Drive
Orlando FL 32807

I need a schematic or service manual for the Com-Data model 301F2 modem and the Com-Data model 201F4-13 modem. I am also trying to find a current address for Jim Labo KØOST/ex-WB8IDD.

John Hackman WB4VVA
5290 East Valley Road
Mount Pleasant MI 48858

I am looking for the service manual for the NCX-3, or schematics for the power supply for the NCX-3 (by National).

Dennis Bosley WA1URS
186 Hickam Drive
Loring AFB ME 04751
(207)-328-4432

Anyone interested in the Chaverim, an organization formed to promote a closer relationship among Jewish radio amateurs and their friends, please contact me.

Claire Kuperman KA3DNJ
1934 Devereaux Avenue
Philadelphia PA 19149

will include transmitter hunts, mobile judging, and a CW contest. Excellent camping facilities will be available. For more information, contact William W. Bosch WDØEMY or Stanley E. Kittelson WDØDAJ, Box H, Dickinson ND 58601.

LOUISVILLE OH
JUL 15

The Tusco Amateur Radio Club (W8ZX) and the Canton Amateur Radio Club (W8AL) will present the 10th annual Hall of Fame Hamfest on Sunday, July 15, 1984, at the Nimishillen Grange, 6461 Easton Street, Louisville OH. Admission is $2.50 in advance and $3.00 at the gate. Tables are for rent on a reserved basis. Talk-in on 146.52/.52 and 147.71/.12. For reservations or more information, write Butch Lebold WA8SHP, 10877 Hazelview Avenue, Alliance OH 44601, or phone (216)-821-8794.

WASHINGTON MO
JUL 15

The 22nd annual Zero-Beaters ARC Hamfest will be held on July 15, 1984, from 9:00 am to 3:00 pm, at the Washington MO Fairgrounds. There is no admission charge. Advance reservations for flea-market spaces under the pavilion are limited and advance reservations are advised. There will be a candy scramble, a gigantic traders' row, sandwiches, dinners, and other refreshments. Talk-in on 147.24/.84 and 146.52. For further information, write Zero-Beaters ARC, Box 24, Dutzow MO 63342.

EDGEWATER PARK NJ
JUL 15

The West Jersey Radio Amateurs will hold their 6th annual hamfest on Sunday, July 15, 1984, from 9:00 am to 3:00 pm, rain or shine, at the Super 130 Drive-In Theatre, Route 130, Edgewater Park NJ (2 miles south of Burlington, 8 miles north of Palmyra). Registration is $3.00 (sellers must bring their own tables). Setup for vendors only is at 7:00 am. Talk-in on 147.75/.15, 144.87/.47, and 146.52. For more information or advance tickets, send an SASE to Mary Lou Shontz N2CLX, 107 Spruce Lane, Route 16, Mount Holly NJ 08060, or phone (609)-267-3063.

LAPORTE IN
JUL 15

The combined LaPorte-Michigan City Amateur Radio Clubs will sponsor their Summer Hamfest on Sunday, July 15, 1984, from 8:00 am to 2:00 pm, at the LaPorte County Fairgrounds, State Road 2, west of LaPorte IN. The donation is $3.00 at the gate. Good food, cold drinks, and paved outdoor parking will be available. For reservations for indoor tables (40¢/foot), write PO Box 30, LaPorte IN 46350.

KUOPIO, FINLAND
JUL 19-22

The Amateur Radio Club of Kuopio will hold the annual hamfest of the Finnish Amateur Radio League (SRAL) on July 19-22, 1984, in Rauhalahti. Activities will include SRAL forums, technical and DX talks, indoor and outdoor programs, and special events for ladies and children. For further information, contact Joxa Hartikainen OH7OO, Kauppakatu 45, SF 70100 Kuopio, Finland.

GLACIER PARK MT
JUL 20-22

The Great Falls Area ARC will present the 50th annual Glacier-Waterton International Hamfest on July 20-22, 1984, at Three Forks Campground on the southern edge of Glacier National Park. Pre-registration is $8.50 and includes Saturday-night dinner (bring own meat and utensils) and Sunday-morning breakfast. Talk-in on .52 and .34/.94. For more information, send an SASE to Shirley Smith KC7OA, 1822 14th Avenue South, Great Falls MT 59405.

TORONTO ONT CAN
JUL 20-22

The Ontario DX Association will sponsor the ANARC 1984 Convention on July 20-22, 1984, at the Ramada Renaissance Hotel in Toronto. Registration is $20.00 per person. Activities will include seminars on radio listening, displays from manufacturers of hobby equipment, forums with broadcasters from around the world, and a Saturday-evening banquet. The banquet fee is $25.00 per person. For registration information and a schedule of activities, send a self-addressed envelope and a first-class stamp (do not affix the stamp to the envelope) to ANARCON '84, PO Box 232, Station Z, Toronto, Ontario, Canada M5N 2Z4.

WELLINGTON OH
JUL 21

The Northern Ohio Amateur Radio Society will hold its 7th annual ARRL-approved NOARFEST on July 21, 1984, from 8:00 am to 4:00 pm, at the Lorain County Fairgrounds, Wellington OH. Donations are $3.00 in advance and $3.50 at the gate. Children under 12 will be admitted free. There will be a huge blacktopped flea-market area and parking is $1.00 per car space. Flea-market setup is from 6:00 am to 8:00 am. Indoor exhibit spaces with an 8-foot table are $8.00 each. Send check for advance registration to John Paul Jones WA8CAE, 4612 Timberview Drive, Lorain OH 44052, or phone (216)-282-4256. Campers may park overnight Friday at no charge but no hookups will be available. Talk-in on 144.55/145.15 and 146.52. For admission tickets, write NOARFEST, PO Box 354, Lorain OH 44052.

PETOSKEY MI
JUL 21

The Straits Area ARC will hold its annual swap shop and computer demonstration on July 21, 1984, from 9:00 am to 2:00 pm, in the 4-H Building at the Emmet County Fairgrounds. Admission is $2.50 and tables are $3.00 each; setups are at 8:00 am. RV camping will be available nearby. Talk-in on 146.67 and .52. For more details, write Irene Stein KA8NKS, 4487 Robinson Road, Pellston MI 49769, or phone (616)-539-8986.

CROSSVILLE TN
JUL 21-22

The Cookeville Repeater Association and the Plateau ARC will hold the annual Crossville Hamfest on July 21-22, 1984, at the Cumberland County Community Complex, Highway 70N, Crossville TN. Talk-in on 147.69/.09 and 147.93/.33. For further information, contact PARC, PO Box 2621, Crossville TN 38555.

PALMYRA IL
JUL 21-22

The Quad-Co. Amateur Radio Club will sponsor the 27th annual hamfest of the Breakfast Club on July 21-22, 1984, at Terry Park, ¼ of a mile east of Palmyra IL. Camping facilities will be open from Friday afternoon until Monday morning. There will be

✓ See List of Advertisers on page 98

games, contests, golfing, fishing, and gear swapping, and on Saturday night, dancing and movies. Bring your own basket lunch; sandwiches and soft drinks will be available. Talk-in on 3973 kHz from noon Saturday to 11:00 am Sunday. For more information, write Hamfest, c/o Quad-Co. ARC, 602-D East Walnut, Chatham IL 62629.

EUGENE OR
JUL 21-22

The 9th annual Lane County Ham Fair will be held on July 21-22, 1984, at the Oregon National Guard Armory, 2515 Centennial (across from Autzen Stadium), Eugene OR. Doors will open at 8:00 am both days. Registration and swap tables are $5.00 each. Because of limited space, a nonrefundable reservation is required for swap tables (maximum: 2). In addition to swap tables, features will include a 2-meter bunny hunt, technical seminars, computer demonstrations, license exams, bingo, a kiddie korner, and women's activities. There will be an all-day snack bar, free parking for RVs (no hookups), and a Saturday pot-luck supper at 6:00 pm. Talk-in on 146.28/.88, 147.86/.26, and on .52/.52. For advance tickets or table reservations, send a check payable to Lane County Ham Fair and an SASE to Tom Temby WB7WPU, Treasurer, 3227 Crocker Road, Eugene OR 97404, or phone (503)-689-1761. Ticket packets may also be picked up at the pre-registration table at the Ham Fair.

OKLAHOMA CITY OK
JUL 21-22

The Central Oklahoma Radio Amateurs will host Ham Holiday and the State ARRL Convention on July 21-22, 1984, at the Lincoln Plaza Inn and Conference Center, 4445 Lincoln Boulevard, Oklahoma City OK 73105. Pre-registration (before July 6th) is $8; at the door, tickets are $10. The Saturday-evening banquet ticket is $14.00 and the Sunday QCWA breakfast is $7.20. Flea-market tables are $5.00 each in advance and, if available, $8.00 each at the door. In addition to these activities, there will be programs, special-interest events, unlimited free parking for cars and self-contained RVs, the flea market on Saturday, and dealer displays on Saturday and Sunday. For reservations, write CORA, PO Box 44091, Oklahoma City OK 73144. For a special hotel rate of $47.00 (plus tax) for a double, call (800)-522-8034 (Oklahoma) or (800)-654-8419 (out of state).

WHEELING WV
JUL 22

The Triple States Radio Amateur Club will hold its 6th annual Wheeling WV Hamfest on Sunday, July 22, 1984, from 9:00 am to 4:00 pm, at Wheeling Park. Admission is $3.00 and children 12 and under will be admitted free. Dealers are welcome and tables are available. There will be a flea market and auctions, all under cover. Refreshments and free parking will be available. Talk-in on 146.31/.91 and 147.75/.15. For a four-page brochure with more information and a map, contact TSRAC, Box 240, RD 1, Adena OH 43901, or phone (614)-546-3930.

BEAVERTON OR
JUL 27-29

The Willamette Valley DX Club will hold the 1984 DX Convention on July 27-29, 1984, at the Greenwood Inn, Beaverton OR. For further information, write Bob Herndon W7XN, 607 Andover Place, Portland OR 97202, or phone (503)-232-2740.

HOUGHTON MI
JUL 28

The Copper Country Radio Amateur Association will host the 1984 Upper Peninsula Hamfest on July 28, 1984, at the Memorial Union Cafeteria on the campus of Michigan Technological University, Houghton MI. For further information, write Howard Junkin N8FHF, Co-Chairman, UP Hamfest, 106 West South Street, Houghton MI 49931, or phone (906)-482-4630.

GLENWOOD SPRINGS CO
JUL 28

The Ski Country ARC will hold its third annual swapfest, in conjunction with the CCARC meeting, on July 28, 1984, from 9:00 am to 3:30 pm, at the CMC building, 1402 Blake, Glenwood Springs CO. Full tables are $5.00 and half tables are $3.00. There will be guest speakers and demonstrations. Talk-in on 146.07/.67. For further information, contact Bob Ludtke K9MWM, 1001 Grand Avenue, Glenwood Springs CO 81601, or phone (303)-945-5966.

ASHEVILLE NC
JUL 28-29

The Western North Carolina Hamfest and Computer Fair will be held on July 28-29, 1984, at the Buncombe County Fireman's Association Training Center in West Buncombe County, near Asheville. There will be large indoor areas with dealers' tables ($5.00 each per day), an outdoor flea market, and spaces for self-contained vehicles (no hookups). For more information or reservations, contact Ed Erwin WW4O, PO Box 835, 120 Clayton Road, Arden NC 28704.

WEST FRIENDSHIP MD
JUL 29

The Baltimore Radio Amateur Television Society (BRATS) will present the BRATS Maryland Hamfest and Computerfest on Sunday July 29, 1984, at the Howard County Fairgrounds, Route 144 at Route 32, adjacent to Interstate 70, West Friendship MD, about 15 miles west of the Baltimore Beltway (695). Table sales are by advance reservation only; indoor tables along the wall with ac are $20.00 each and indoor tables in the center of the floor without ac are $10.00 each. Quantity discounts and booths are available. There will be plenty of outdoor tailgating and RV hookups will be available. Dealer setups begin Saturday at 2:00 pm with overnight security provided. Talk-in on 146.76 (−600), 147.03 (+600), and .52 simplex. For table reservations and more information, write BRATS, PO Box 5915, Baltimore MD 21208, or call Mayer Zimmerman W3GXK at (301)-655-7812.

NASHVILLE TN
JUL 29

The Radio Amateur Transmitting Society will hold the sixth annual Nashville Ham and Computer Fest on Sunday, July 29, 1984, from 8:00 am to 3:30 pm, at the Nashville Municipal Auditorium at the intersection of James Robertson Parkway and Gay Street in downtown Nashville TN. There will be no admission charge and

tables will be available for $5.00. For further information, send an SASE to Willie Porter KB4BLL, 4907 Idaho Avenue, Nashville TN 37209.

POMONA CA
AUG 4

The Tri-County Amateur Radio Association will hold its annual hamfest on Saturday, August 4, 1984, from 8:00 am to 4:00 pm, at Palomares Park Recreation Hall, 491 E. Arrow Highway (the north side of Arrow Highway at Orange Grove, between Towne and Garey), Pomona CA. Admission is a $1.00 donation. Swap tables (2½' × 8') are a $5.00 donation per table and the hall will open at 7:00 am for setup only. Tables are limited and must be reserved in advance (no personal tables will be allowed inside or outside the hall). Food, drink, and free parking will be available. Features will include awards, programs, and VCR tapes; and examinations will be given, if possible, for Novice, Technician, General, and Advance class licenses. Talk-in on 146.025+. For advance registration, make checks payable to TCARA and send with an SASE to Joe Lyddon WB6UFX, 6879 Sard Street, Alta Loma CA 91701.

TRAIL BC CAN
AUG 4

The Beaver Valley Amateur Radio Club will hold a swapfest on August 4, 1984, beginning at 10:00 am, at the Cominco Arena, Trail BC. Talk-in on 146.84/.24. For further information and reservations for table space, please contact BVARC, c/o 3798 Woodland Drive, Trail BC V1R 2V7.

JACKSONVILLE FL
AUG 4-5

Six amateur radio clubs of the greater Jacksonville area will sponsor the eleventh annual Greater Jacksonville Hamfest on August 4-5, 1984, at the Orange Park Kennel Club, US 17 South near I-295. Registration is $4.00; swap tables are $9.00 for one day or $15.00 for the weekend. (All proceeds go to the promotion of amateur radio.) Saturday hours are 8:00 am to 5:00 pm and Sunday hours are 9:00 am to 3:00 pm. Features will include a large swap-table area, forums and programs, exhibitors, and plenty of free parking. Special discounts and promotions are available to exhibitors contracting for space before July 15th. For registrations, swap tables, special hotel rates, and more information, write Mike Parnin N4EPD, 6716 Diane Road, Jacksonville FL 32211.

ANGOLA IN
AUG 5

The Steuben County Radio Amateurs will present the 26th annual FM Picnic and Hamfest on Sunday, August 5, 1984, at Crooked Lake, Angola IN. Admission is $2.50. Features will include picnic-style BBQ chicken, inside tables for exhibitors and vendors, a large electronics flea market, and overnight camping (fee charged by County Park). Talk-in on 146.52 and 147.81/.21.

AUSTIN TX
AUG 10-12

The Austin Amateur Radio Club and the Austin Repeater Organization will sponsor Austin Summerfest '84 on August 10-12, 1984, at the Austin Marriott Hotel, Interstate 35 at Highway 290. Admission is $5.00 in advance (deadline: July 31st) and $7.00 at the door. Swapfest tables are available on a first-come, first-served basis, but each seller may reserve tables in advance (limit 2) for $1.00 each and claim them by 10:00 am Saturday. Activities will include a 20-kHz 2-meter band-plan forum, a packet-radio discussion and demonstration, a transmitter hunt, and a full schedule of ladies' programs. Admission to the ladies' events is $4.00. Talk-in on 146.34/.94. For more information, write Austin Summerfest '84, PO Box 13473, Austin TX 78711.

TACOMA WA
AUG 11-12

The Radio Club of Tacoma (W7DK) will present Hamfair 1984 on August 11-12, 1984, at Olsen Auditorium on the campus of Pacific Lutheran University. Registration is $5.00 and trailer and dormitory space will be available on campus at reasonable rates. Advance registration is available for the Saturday-night banquet, commercial space, and flea-market tables. Talk-in on 147.88/.28 (W7DK). For additional information and advance registration, please contact Grace Teitzel AD7S, 701 South 120th, Tacoma WA 98444.

CHARLOTTE VT
AUG 11-12

The annual BARC International Hamfest will be held on Saturday and Sunday, August 11-12, 1984, at the Old Lantern Campgrounds, Charlotte VT. Tickets are $4.00 for both days and heterodynes under 12 will be admitted free. Flea-market space is $2.00 and indoor space is $5.00. Overnight camping will be available and features will include the Can-Am tug-of-war. Talk-in on .34/.94, .01/.61, and .52 simplex. For additional information, contact Roger Farley WA1OZE, President, Burlington ARC, PO Box 312, Burlington VT 05402.

CANYON TX
AUG 11-12

The Panhandle Amateur Radio Club, Inc., will hold its annual hamfest on Saturday and Sunday, August 11-12, 1984, in the Student Activities Center, West Texas State University, Canyon TX. Doors will open at 8:00 am each day with plenty of free tables and space for all. Registration per person is $5.00 in advance and $6.00 at the door. Features will include a swapfest, commercial distributors, meetings, and a ladies program. Talk-in on 146.94 and 3.933 MHz. For more information on pre-registration, motels, and RV camps, contact the PARC, PO Box 10221, Amarillo TX 79116, or Jim Ogle WB5UDX at (806)-359-1002.

WARRINGTON PA
AUG 12

The Mid-Atlantic Amateur Radio Club will hold its annual hamfest on Sunday, August 12, 1984, from 9:00 am to 4:00 pm, rain or shine, at the Bucks County Drive-In, Route 611, Warrington PA (5 miles north of the Willow Grove exit of the Pennsylvania Turnpike). Admission is $3.00 with $2.00 additional for each tailgate space (bring your own table). Ample parking and refreshments will be available. Talk-in on 147.66/.06 (WB3JOE/R) or 146.52. For further information, write MARC, PO Box 352, Villanova PA 19085, or call Bob Josuweit WA3PZO at (215)-449-9727.

WILLOW SPRINGS IL
AUG 12

The 50th annual Hamfesters' Hamfest will be held on Sunday, August 12, 1984, at Santa Fe Park, 91st and Wolf Road, Willow Springs IL (southwest of Chicago). Tickets are $3.00 in advance and $4.00 at the gate. There will be an exhibitor's pavilion and the famous swappers' row. Talk-in on 146.52. For advance tickets, send a check or money order to Hamfesters, PO Box 42792, Chicago IL 80642.

GEORGETOWN KY
AUG 12

The Bluegrass Amateur Radio Society will sponsor the Central Kentucky ARRL Hamfest on Sunday, August 12, 1984, from 8:00 am to 5:00 pm, at Scott County High School, Lonlick Road and US Route 25, Georgetown KY (off I-75/64). Tickets are $3.50 in advance and $4.00 at the gate. There is no charge for outside flea-market space. Features will include technical forums, awards, and exhibits in a/c facilities. For more information or tickets, write Edward B. Bono WA4ONE, PO Box 4411, Lexington KY 40504.

HAVRE MT
AUG 17-19

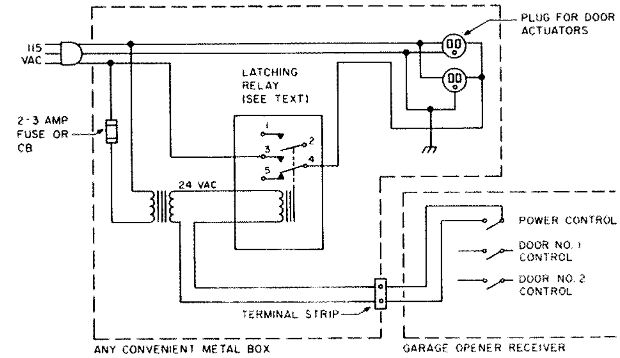
The Northcentral Montana Hamfest will be held on August 17-19, 1984, in Beaver Creek Park at Marden's Campground, 28 miles south of Havre MT.

✓ See List of Advertisers on page 98

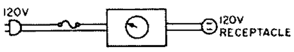
CIRCUITS

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

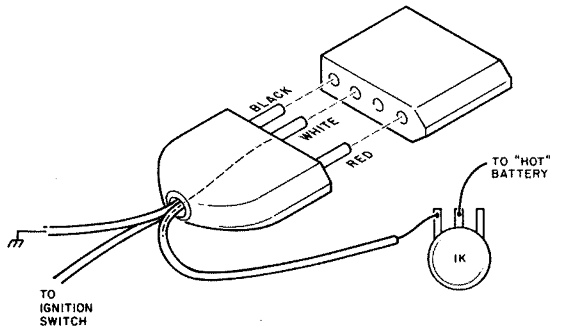
In exchange for these technical gems, 73 offers you the choice of a book from the Radio Bookshop, *to be sent upon publication. Submit your idea (and book choice) to: Circuits, Editorial Offices, 73* Magazine, *Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.*



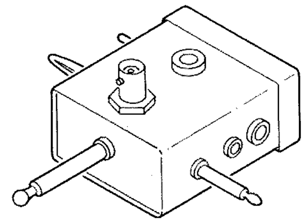
A GARAGE-DOOR OPENER CAN DO MORE: You can make the spare channels on a garage-door opener with the circuit shown here. Anything you want can be turned on or off, as long as it is within the amperage capability of the relay. One part, the latching relay, can be found at Heath (part #273-3). The transformer to operate it is part #273-4.—James Smith K5PTC, Irving TX.



ANOTHER HEAT CONTROL FOR A SOLDERING IRON: This control uses a solid-state dimmer switch. These high-low rotary dimmer switches will control resistance loads of up to 600 Watts. Wire one up with a fuse in a small utility box and you will have an infinite heat control for soldering. Incidentally, if you use a dimmer switch rated at 600 Watts, it can also be used as a speed control for your 3/8-inch electric drill.—E. A. Rowe W7PWQ, Chelan WA.



PERMANENT POWER FOR THE IC-25A/H: Here's a way to keep your memory without having to worry whether you left the radio on. Add a third connection in the power plug as shown. Connect this to a continuous 12-V source through a suitable resistance to drop it to 9 V (I used a 1k trimmer adjusted to 670 Ohms). Connect the normal power lead of the radio to an appropriately-switched 12-V source, and the memory will receive power even when the radio is turned off.—Virginia Smith KA6NVB, San Diego CA.



MULTIPLE PLUG ADAPTER: After years of struggling to find the right adapter for the right piece of gear, I built one that handles many types of connections. I took a small hinged-lid box, like the boxes that small bandages come in, and mounted a phone plug on one end. Then I added a variety of different sockets on the sides of the box. I included BNC and RCA connectors, pin jacks, small sockets, and banana jacks. Now I save a lot of time when servicing and testing.—Wm. Bruce Cameron WA4UZM, Temple Terrace FL.

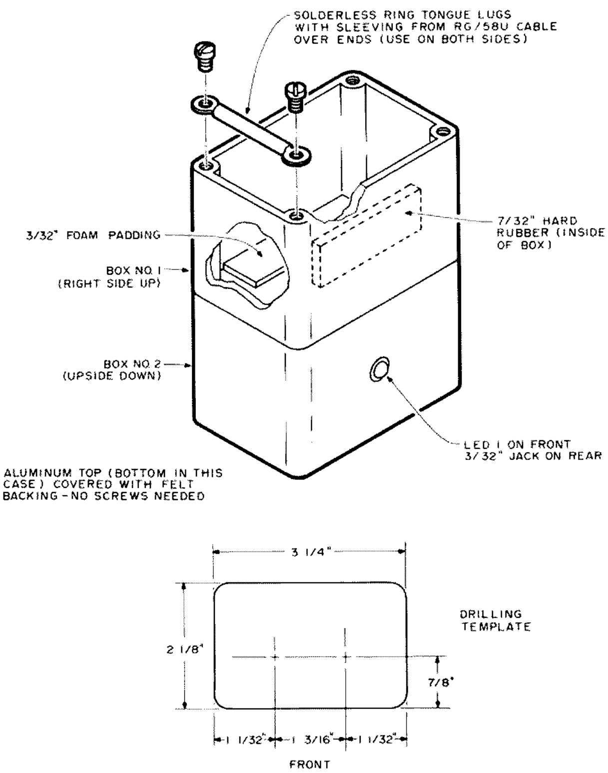


Fig. 1. Mechanical details.

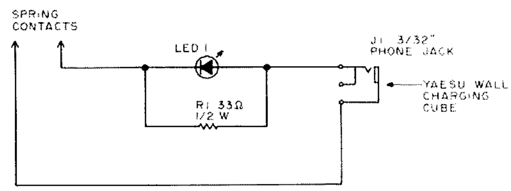


Fig. 2. Charger schematic.

STAND-UP CHARGER FOR YAESU HTs: Inexpensive Radio Shack parts can be used to make a charger for the Yaesu FT-208R transceiver. Small screws (such as 6-32 MS) are threaded through both boxes (RS #270-230) using the drilling dimensions shown in Fig. 1. Matching spring material is threaded onto both screws to make contact with the charging buttons on the bottom of the FT-208R. Experiment to get the best contact, then add rubber padding to the top box to obtain a snug fit. The charging circuit in Fig. 2 will drop the normal charging current about 10 mA, from 45 mA to 35 mA, which will increase the total charging time. J1 is RS #274-292, R1 is RS #271-007, and LED1 is RS #276-069. The LED will glow only when proper contact is made with the bottom contacts of the HT.—David F. Miller K9POX, Niles IL.

BARTER 'N' BUY

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Copy must be received in Peterborough by the 5th of the second month preceding the cover date.

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WANTED: Cash paid for used SPEED RADAR EQUIPMENT. Write or call: Brian R. Esterman, PO Box 8141, Northfield IL 60093; (312)-251-8901. BNB030

MILITARY TECHNICAL MANUALS for old and obsolete equipment. 60-page catalog, $3.00. Military Technical Manual Service, 2266 Senasac Ave., Long Beach CA 90815. BNB045

WANTED—your unused Teletype™ repair parts. High prices paid! Send SASE for list of Teletypewriter parts and supplies. TYPETRONICS, Box 8873, Fort Lauderdale FL 33310; (305)-583-1340 after 9:00 pm. N4TT. BNB052

WANTED: Pre-1950 TV sets and old *TV GUIDE* magazines. W3CRH, Box 20-S, Macomb IL 61455; (309)-833-1809. BNB066

1984 WIRE & CABLE prices cut!!! Call or write for latest listings. Certified Communications, "The CB to 10 Meter People," 4138 So. Ferris, Fremont MI 49412; (616)-924-4561. BNB073

EMERGENCY COMMUNICATIONS—An Organizational and Operational Handbook, by K3PUR. A complete reference guide for ARES/RACES and other public service groups, as reviewed in December '83 *QST* and January '84 *CQ*. $9.95 plus $1.50 P/H to: FDW Arts, 1394 Old Quincy Lane, Reston VA 22090 (VA residents, add 4% tax). BNB089

DX HEADING MAPS for Boston, NYC, Philadelphia, Baltimore, Detroit, Atlanta, Chicago, New Orleans, St. Louis, Dallas, LA. 11" × 17", $1.75 pp. 22" × 34", $5.95 pp. Specify city. Massey, PO Box 397, Hainesport NJ 08036; (609)-261-2952. BNB094

STATE-OF-THE-ART, rugged, low-profile antenna systems. Helical designs from 3.5 to 50 MHz. DDRRs from 144 to 450 MHz. Refer to *73* magazine reviews in October and November, 1982. Com-Rad Industries, 25 Imson Street, Buffalo NY 14210; (716)-773-1445. BNB096

ANTI-STATIC DUST COVERS by Cover Craft Corporation. Amateur radio, computers, printers, disk drives, VCRs. New or older models. Over 1,000 designs in stock and over 1,000,000 in use. Call or write for brochure. Birch Hill Sales, PO Box 234, Peterborough NH 03458; (603)-924-7959. BNB097

FIND OUT what else you can hear on your general-coverage transceiver or receiver. Complete information on major North American radio-listening clubs. Send 25¢ and SASE. Association of North American Radio Clubs, 1500 Bunbury Drive, Whittier CA 90601. BNB099

MAGICOM RF SPEECH PROCESSORS—Add 6 dB of average output with genuine rf clipping in your transmitter's i-f stage. Custom engineered for Kenwood TS-120, TS-130, TS-430, TS-520, TS-530, TS-820; Drake T-4X, TR-7; Yaesu FT-102. Excellent speech quality, simple installation, affordable prices! SASE for data and cost. Magicom, PO Box 6552A, Bellevue WA 98007. BNB101

ELECTRONIC AVOCATIONS™. Nonprofit service promoting radio hobbies. SASE. Arnold Timm, 2308 Garfield #304, Minneapolis MN 55405. BNB106

FM SERVICE MANUALS—RCA, GE, Motorola, Aerotron, Alpha, Johnson, Kaar, DuMont, others. Reasonable. Send exact model and description. T. McLaughlin, PO Box 411, Mango FL 33550. BNB110

REPAIR, alignment, calibration. Collins written estimates, $25; non-Collins, $50. K1MAN, (207)-495-2215. BNB117

IMRA—International Mission Radio Association helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont NY 10538. BNB123

WANTED: Model 8010 remote vfo for Tempo 2020 xcvr. Call collect (913)-267-1575 or Compuserve E-mail user no. 71336,1270. Will pay all shipping charges. Tim Gorman WAØLYJ, 3758 Humboldt, Topeka KS 66609. BNB125

ICOM AND KENWOOD OWNERS! You are definitely missing out if you do not receive our very informative newsletters! Free information! Send SASE (2 stamps) to International Radio, Inc., 364 Kilpatrick Ave., Port St. Lucie FL 33452. BNB129

BUY-SELL-TRADE twice monthly publication! SASE for FREE issue. *The Ham Boneyard*, 364 Kilpatrick Ave., Port St. Lucie FL 33452. BNB130

WANTED: Collins KW-1 transmitter. Paul Kluwe KB8Q, Box 84, Manchester MI 48158. BNB147

GROUND RADIALS WORK—Solve your vertical antenna problems with the fantastic ground plane one (GP-1). A 10"-diameter, 24-point cast-aluminum bus that fits any 2"-diameter or smaller mast. Radial problems solved for only $24.95. Send an SASE for photos and brochure. Lance Johnson Engineering, PO Box 7363, Kansas City MO 64116. BNB148

CDE ROTOR OWNERS—You need a "D-Lay-5!" This easy-to-install circuit protects the rotor from damage caused by accidental braking. Works with the Ham II, Ham III, Ham IV, and Tailtwister models. Provides a five-second safety factor in your rotor brake. Incredible value at $19.95. Postage paid worldwide. Lance Johnson Engineering, PO Box 7363, Kansas City, MO 64116. BNB149

ELECTRON TUBES: Receiving, transmitting, microwave . . . all types available. Large stock. Next-day delivery in most cases. Daily Electronics, 14126 Willow Lane, Westminister CA 92683; (714)-894-1368. BNB150

JOHNSON 6 & 2, $35. Johnson Matchbox, $25. RCA mobile test set, $15. CRT test set, $10. Knight tube tester, $15. K6KZT, 2255 Alexander, Los Osos CA 93402. BNB151

WANTED: copy of service manual and schematic for Fairchild TV Camera TC-177RL. Will pay for copying. L. Ferguson WBØPXQ, Route 1, Brady NE 69132. BNB152

SCIENCE SOFTWARE for VIC-20 and PC-2. Radio astronomy, moonbounce, amateur satellites, etc. David Eagle, 7952 W. Quarto Dr., Littleton CO 80123; (303)-972-4020. BNB153

TEST EQUIPMENT. Measurements 920 deviation meter—$325. Measurements 801A FM sig gen—$400. Measurements 560 FM sig gen—$250. Marconi TF1066A AM/FM, 10-470-MHz sig gen—$350. Simpson 160 VOM—$25. Systron-Donner 1037/1292 15-GHz counter—$500. SASE for list. Brian Whitney, 2490 Madison Ave., Yuma AZ 85364; (602)-726-8753, eves, wknds. BNB154

WANTED—Gilfer Associates GAR-7 frequency counter for Yaesu FRG-7 receiver. Also, frequency counter for Heathkit HW-101. George Ellison, Rt. 1, Box 146-B, Eatonville WA 98328. BNB155

HW-101 OWNERS! Put RIT in your transceiver for under $10. Plans, $6. B. Bennett, Box 201, Alexandria Bay NY 13607. BNB156

BEAT the over-priced antenna market. We manufacture antennas and kits, and stock a wide variety of 6061-T6 .058-wall aluminum tubing. Use our concept and only your imagination will be the limit. Write Antenna Dimensions, PO Box 340, Germanton, NC 27019. BNB157

WANTED: pre-1950 bugs and pre-1925 wireless keys for my collection. Neal McEwan K5RW, 1128 Midway, Richardson TX 75081; (214)-234-1653. BNB158

FREE CATALOG—computer supplies. Control Data SS/DD, $21; DS/DD, $31. Dysan SS/DD, $30; DS/DD, $40. Ribbons: MX80, $7.50; MX100, $14; Okidata 82-92, $2.50; Okidata 84, $5.00; Diablo Hytype II m/s, $4.40; Diablo Hytype II nylon, $4.80; NEC Spinwriter m/s $4.75; 6-outlet surge and spike power strip, $49.95. Shipping, $3.00. Mastercard/Visa—include number and expiration date. OUTPRINT, 44 Forrest Road, Randolph NY 07869. BNB159

"ELECTRONIC BONANZA." Icom, Sony, Kenwood, Yaesu, Uniden, Panasonic, Bearcat, Regency, MFJ, CBs, antennas, coax, CW/RTTY decoders, marine, much more!! Free UPS shipping and insurance to 48 states. 25-page picture catalog, $1.00 (refundable). Galaxy Electronics, Box 1202--, 67 Eber Ave., Akron OH 44309; (216)-376-2402, 9:00-5:00 EST. BNB160

DIGITAL AUTOMATIC DISPLAYS for FT-101s, TS-520s, Collins, Drake, Swan, Heath, and others. Six ½" digits. Write for information. Grand Systems, Dept. A, PO Box 3377, Blaine WA 98230; (604)-530-4551. BNB161

RADIO SHACK dealer, large computer discounts. Ben Dickerson K3DQU, Box 520G, Starke FL 32091; (904)-964-7474. BNB162

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C-64 AND VIC-20 ham software: new contest-II program, call-name-QTH log program, ham formulas program, much more, LSASE for list. Specify computer. Walt KA9GLB, 4880 N. 49th St., Dept. 7, Milwaukee WI 53218. BNB164

THE BIG ONE for Indiana, the WA8VZY repeater serves at least 46 counties from nearly 1500 feet above sea level at Fairland. Try the "Mighty 525" (144.65 in/145.25 out) on your next trip through the central half of Indiana. Transients, repeater DXers, and aeronautical mobiles all welcome. Full autopatch privileges, covering 102 greater Indianapolis exchanges, available for the rest of 1984 for $12. Donations sincerely appreciated. Send to: Bob Hawkins, WA8VZY, Box 19255, Indianapolis IN 46219. BNB165

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COMMODORE 64 CW INSTRUCTOR PROGRAM. Generates CW on TV speaker. Random code, keyboard input, or prerecorded "CW tests." Character speed and spacing set independently. Designed for classes and increasing code speed. $15.00, diskette or cassette (specify). Dennis Olver N7BCU, 20909 S. Ferguson Rd., Oregon City OR 97045. BNB167

FOR RENT: "Ham-Home," northern Virginia, five miles southwest of Pentagon, three bedrooms, "family room," 50-foot telephone pole, tribander, 14-el two-meter, 40/80-meter dipole, ½ acre, fenced yard. Available August '84. K1CTK/4. Use *Callbook* address. Phone (703)-379-7437 evenings. BNB168

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 8

have about 500 high schools that have ham clubs today. In Japan, there are over 5,200 high schools with ham clubs. And in Japan, when *they* have a *club*...how many of you have ever seen a copy of the Japanese *CQ ham radio* magazine? Runs six or seven hundred pages a month with about a hundred pages of club activities with pictures of maybe 50 to three or four hundred people in the group all having a whale of a time. *Every month.* It's like Dayton every week.

So I hope to do something about that. What I would like to do eventually is to encourage *every high school* in the United States to have a period of their school—one period during school hours—set aside for a high-tech hobby club, amateur radio, computer, astronomy, whatever.

If you make it after school, you run into two problems which are not surmountable. Number one is busing. Number two is overtime pay for teachers. If it's after school, the unions require that they get overtime and that's not in the school budget.

So let's make the club *during* school hours. And I'll bet you if we do that, that we can get virtually every ham club in the country to volunteer somebody to go in and help those students learn and know more about amateur radio. I *know* that I can get the computer-club people to go in and help with the computer clubs.

The rules and regulations. I don't know how many of you have read 97 recently. Not many, I'll bet. But right there up front, 97.0 gives reasons why amateur radio is a service. One reason is to supply communications in case of an emergency. Another reason is to invent and pioneer new technology. Another reason is international friendship.

I'd like to just speak briefly on that [97]. I don't know how many of you operate 20 meters and have listened to the pileups...the list operation on the contests. As far as international friendship is concerned: hardy, har, har, har. [Guffaws.]

Inventing and pioneering new technologies. About 20 years ago, we were pretty good at that. We invented and pioneered single sideband. We invented and pioneered narrowband FM. And, as they say, what have *you* done for us lately? *Not much.*

Unfortunately, most of the pioneering, most of the inventing, is done by youngsters. And we have stopped having youngsters coming into the hobby.

Our country has lost over one *million* engineers and technicians that would have come into the industry by way of amateur-radio-starting. And that's why we are not designing or building very much electronic equipment or that has a lot to do with it.

I hope we can reverse that. Have you seen any military equipment lately? It's all high-speed digital. How many people here are on high-speed digital? Thank you. We have one person here who might be of value to the military. No, forty years ago when we had a war you read about it in the papers; 80 percent of the hams volunteered and went into the military. And we were *of value*.

But we are so hopelessly out of touch with electronic technology today and unfortunately such a high percentage of us are in our 50s, 60s, and 70s, and 80s that we're really not of much value to the country any more as a supply of trained operators. [Grumbling.]

That leaves us with emergency communications. The replies that were sent to the FCC by about a hundred ARRL clubs on the no-code proposal were very clear. And they said in essence (and I would say they said very clearly) that we need Morse code because it's the only means of communication of last resort. When everything else fails, you have Morse code.

I would like to see somebody convert a transistor radio for CW. I would like to see somebody take an HT and dust it off after the atomic attack and try to make it work on Morse code. Because that's what we're going to have, mobile rigs and HTs.

Yes, 30 years ago when you had tube radios, you could wire something up and make a Morse-code transmitter out of it. And we have all those people that used to be able to do that commenting on the no-code license. I look and see what Japan has done with that and the supply of Japanese licensed amateurs increasing from 18,000 to one and a quarter million at the same time that we went from 285,000 to 400,000.

And (unfortunately) they are the best operators in the world. For those who say you must have Morse-code skill in order to be a good operator, I've never seen any correlation.

Now, I don't know if no-code would work in this country or not and would make a difference and would encourage people to get into amateur radio. But I think it's worth a try.

If Morse code is that important and if that is what we are going to have to depend upon when the atom bombs fall (for communication), I don't see any other choice but to make sure that every amateur is *very, very* good at Morse code. You don't really have any choice.

You've *got* to be good at it because you're going to have to handle millions of messages. You're going to have to handle an *incredible* amount of messages.

I've just made a note of a few of them. You've got to handle traffic about radiation and where the detectors are, military communications, law and order communications, food, water, shelter, clothing, medical help, medical supplies, evacuation, toilet facilities, power, getting equipment around where it is needed, travel communications, and so forth.

You've got an enormous amount of things you're going to have to handle.

Anybody who has done emergency communications knows what I am talking about. You are immediately overloaded enormously and hams have to work 36 hours at a time without stopping and they still fall way behind on trying to keep up with *minor* emergencies. And we're talking about—now—when the chips are down. We're talking about being able to supply emergency communications in case of nuclear attack. And we can't *plan* for anything *less*.

We have painted ourselves into a corner that we can't get out of on that. There is no way that we can provide even a fraction of what is needed. And we have stopped ourselves from essentially being able to do anything about it.

What *could* we do? We could start working toward high-speed digital communications with little units maybe a third the size of the Model 100, where you can write messages. And we can have our repeaters so they relay them automatically, as I said before. And all of this, if we have enough *hams*, will be done very inexpensively, will be done with single chips.

Think of the communications facility we would have if you could pick virtually anybody that you wanted to talk with and write a message to him and have it automatically delivered. It would be a different kind of amateur radio.

If we tuned 15 meters and every time you came across a signal, the call letter flashed on your transceiver on a little readout because he's sending his call automatically on a subcarrier at high speed...and it would read out and you could tune, you could have, you could punch in on your keyboard, the prefix that you're looking for. You could work all 350 countries in alphabetical order [chuckles]—in a day, if there's a few DXpeditions out there. And at the DXpedition, all you have to do is send the box and have an automatic flip-up antenna at the post office. [Guffaws.] And have a little chip in there that prints out the awards certificate when you contact the station automatically. [Guffaws.]

Well, I joke about it, but it isn't that far off. We *could do that.* And *indeed*, if we *don't* have a *system* that can handle that quantity of communications and do it *automatically* and not insist on having a *skilled* operator present, we're not going to be able to provide the communications that are needed.

Now, it's up to us to design equipment, to buy it, make it

work, and have it ready, but it should be capable of being operated by anybody.

Questions

Just one comment: Sixty million is kind of Mickey Mouse, isn't it?
I don't know, it seems kinda good. [Guffaws.] I haven't had any emotional problems with it. [More.] I guess the main people who have had emotional problems with it are the people around me because I haven't changed much. I still live in a one-room apartment over my office and everybody says, "Gee, you're so wealthy, you should have an estate and everything like that." It isn't that bad. Yeah?

Yeah, you talked about in one of your editorials about liking all these gadgets. I just wonder how you fit them all in?
Well, fortunately the gadgets that I like are all very small. And it's not that much of a problem. Everything is, you know, they're all small. I'm a gadget fanatic—but, very few large gadgets. Yes?

You're still the owner of 76, aren't you?
Pardon me?

You still own 76?
73? No, I sold 73. I am still the publisher and president of the corporation but it is *owned* by IDG. And we changed the name of it to CW Communications in honor of Morse Code. [Guffaws.] You notice my little key up here. [Gold lapel pin.]

. . . I thank you all very much for coming. If you have any further questions, come up here and ask them. [Applause.]

✓ *See List of Advertisers on page 98*

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

VENEZUELAN INDEPENDENCE WORLDWIDE CONTEST
SSB
Starts: 0000 GMT July 7
Ends: 2400 GMT July 8
CW
Starts: 0000 GMT July 28
Ends: 2400 GMT July 29

The Radio Club of Venezolano invites all amateurs to participate in the 22nd year of the Venezuelan Independence Worldwide Contest. Use all bands, 80 through 10 meters. Operating classes include: (a) single operator, one band (for each band); (b) single operator, multiband; (c) multi-operator, multiband, one transmitter; (d) multi-operator, mulitband, multi-transmitter.

EXCHANGE:

RS(T) plus a three-digit QSO number starting with 001.

SCORING:

Contacts between stations of different countries count two points. Contacts with stations within one's own country do not count but are valid as multipliers for each band. Count one multiplier for each Venezuelan and USA call area and each country (including own) worked on each band. Use the ARRL DXCC country list. Final score is the total QSO points times the total multiplier points.

AWARDS:

For stations outside Venezuela, there will be a plaque to the highest scorer in each class. Medals to the highest scorer in each continent and among the Bolivarian countries (Bolivia, Colombia, Ecuador, Panama, and Peru) in the single-operator, multiband class. Certificates to all stations in the Americas working 15 YV stations and 10 different countries, all European and African stations working 10 YV stations and 10 different countries, and all Asian and Oceanic stations working 5 YV stations and 10 different countries.

ENTRIES:

Logs must show date and time in GMT, station worked, reports exchanged and respective numerical order, multipliers, and points. Use different sheets for each band worked. Include a separate summary sheet showing name(s) of operator(s), callsign, and address. Each participant must include $2.00 US or IRC equivalent with their logs. Entries must be postmarked no later than August 15 for SSB and September 15 for CW and should be addressed to: RCV, PO Box 2285, Caracas 1010-A, Venezuela.

INTERNATIONAL WORLDWIDE DX SSTV CONTEST
Starts: 0000 GMT July 13
Ends: 2400 GMT July 15

Official rules were not received prior to press time, so I assume there are no major changes from last year.

This is the third annual DX SSTV contest sponsored by *A5 ATV Magazine*. This is a 48-hour SSTV video contest using 80 through 10 meters within the recommended SSTV calling/operating frequencies listed below. To encourage allband contest usage and promotion, extra bonus points are granted on the 10-, 15-, 40-, and 80-meter band segments. Single-and multi-operator stations are recognized, with crossband contacts not permitted. Individual contacts count only once per band with repetitive multiband contacts acceptable.

Callsigns and video reports must be in "video" form. Mug shots of the station operator, family, or friends can count only once. Slower clock-rate speeds are encouraged in either 128 16.5-second or 256 31-second timebases. Color work must contain a minimum of a 2-color overlay to qualify with standard RGB frame transmissions. Motion SSTV must have a minimum of 2 frames sent with automatic-receive switching circuitry or manually-operated switching by the receiving operator and 64 × 64 "quadrant" storage of no less than 4 separate pictures with replays.

SCORING:

Each SSTV two-way contact is worth 5 points within the same country and worth 10 points for DX out of country. Contact bonus points are available as follows: mug shots—1 point, slow speed—2 points, quad frame—3 points, motion SSTV—4 points, high resolution—5 points, and color SSTV (RGB)—10 points.

A band multiplier of 3 can be claimed for contacts on 40 and 80 meters, 2 for contacts on 6, 10, and 15 meters. Stations with over 25 DX countries worked add 25 points, with 50 DX countries add 50 points, and with over 100 DX countries add 100 points!

FREQUENCIES:

Advanced/Extra—3835, 7220, 14230, 21340, 28660, 50.150.

General—3990, 7290, 14340, 21440, 28680, 50.150.

AWARDS:

First-place winner receives a 3-year subscription (worth $60.00) to *A5 ATV Magazine* with front-cover picture plus a Gold Certificate. Second- and third-place winners receive one-year subscriptions and Gold Certificates. All entries regardless of score receive Gold Certificates suitable for framing. Results will be in the November issue of *A5 ATV Magazine*.

ENTRIES:

Submission of logs and totaled scores must be postmarked no later than August 1 and submitted to: Contest Manager, *A5, ATV Magazine*, PO Box H, Lowden, Iowa 52255-0408. Logs will be returned as will any photos, etc.

IARU RADIOSPORT CHAMPIONSHIP
Starts: 0000 GMT July 14
Ends: 2400 GMT July 15

This contest is open to all licensed amateurs worldwide and several changes have been made since last year. The object is to contact as many other amateurs in as many parts of the world as possible using 1.8 through 148 MHz. Single-operator stations must not operate more than 36 hours of the contest period. Operating categories include:

(a) Single operator: phone-only, CW-only, and mixed-mode sections. One person performs all operating and logging functions. Use of spotting nets is prohibited. Off times must be 30 minutes minimum and single-operator stations are allowed only one transmitted signal at any given time.

(b) Multi-operator: single transmitter, mixed mode only. Only one transmitted signal allowed at any given time and must remain on a band at least 10 minutes at a time. All operators must observe the limits of their operator's license at all times.

Stations may be worked once per frequency band; crossmode, crossband, and repeater QSOs do not count.

EXCHANGE:

Signal report and ITU zone.

SCORING:

Count 1 point per QSO within your ITU zone, 3 points within your continent but different ITU zone, and five points with different continents. Multipliers are the number of ITU zones worked on each band. Final score is total number of QSO points multiplied by the sum of ITU zones worked on each band.

ENTRIES:

All entrants are encouraged to use forms available from IARU/ARRL Headquarters; send SASE or 1 IRC. Logs must indicate times in GMT, bands, calls, and complete exchange. Multipliers and off-times should be clearly marked in the

CALENDAR

Jul 1	**Canada Day Contest**
Jul 7-8	**YV Independence Worldwide Contest—SSB**
Jul 13-15	**A5 International SSTV DX Contest**
Jul 14-15	**IARU Radiosport Championship**
Jul 21-22	**SEANET Worldwide DX Contest—CW**
Jul 28-29	**YV Independence Worldwide Contest—CW**
Jul 28-30	**CW County Hunters Contest**
Aug 4-5	**ARRL UHF Contest**
Aug 5-6	**Illinois QSO Party**
Aug 11-12	**New Jersey QSO Party**
Aug 18-19	**SARTG Worldwide RTTY Contest**
Aug 18-19	**SEANET Worldwide DX Contest—Phone**
Aug 24-27	**A5 North American UHF FSTV DX Contest**
Sep 1	**DARC Corona 10-Meter RTTY Contest #3**
Sep 8-9	**ARRL VHF QSO Party**
Sep 15-17	**Washington State QSO Party**
Sep 22-23	**Late Summer QRP CW Activity Weekend**
Oct 6-7	**ARRL QSO Party—CW**
Oct 13-14	**ARRL QSO Party—Phone**
Oct 13-14	**Rio CW DX Party**
Oct 13-15	**Oregon QSO Party**
Oct 20-21	**Jamboree on the Air**
Nov 3	**DARC Corona 10-meter RTTY Contest #4**
Nov 3-4	**ARRL Sweepstakes—CW**
Nov 17-18	**ARRL Sweepstakes—Phone**
Dec 1-2	**ARRL 160-Meter Contest**
Dec 8-9	**ARRL 10-Meter Contest**
Dec 26-Jan 1	**QRP Winter Sports—CW**
Dec 30	**Canada Contest**

RALEIGH AMATEUR RADIO SOCIETY
RARS
WORLDWIDE FRIENDSHIP

EXCITER

NEWSLETTER OF THE MONTH

This month's winner, *The RARS EXCITER*, is edited by Ann Bradley WA4APK (ably assisted in May by Murray Hake W6MVZ). Packed with information of all sorts, it's another great example of excellence in ham radio journalism.

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

logs. Cross-check sheets are required if more than 500 QSOs total are made. Entries must be postmarked by August 15; any entry received after mid-October may not be in time to be included in the printed results. Usual conditions of entry and disqualification apply. Entries should be addressed to ARRL Headquarters in Newington, Connecticut.

AWARDS:

A certificate will be awarded to the high-scoring CW-only, phone-only, mixed-mode, and multi-operator entrant in each ARRL section, each ITU zone, and each DXCC country. In addition, achievement-level awards will be issued to those making at least 250 QSOs or having a multiplier total of 50 or more. Additional awards may be made at the discretion of each country's IARU society.

SEANET WORLDWIDE DX CONTEST

CW

Starts: 0001Z Saturday, July 21
Ends: 2359 Sunday, July 22

Phone

Starts: 0001Z Saturday, Aug 18
Ends: 2359 Sunday, Aug 19

Use 160- through 10-meter bands. Entry classifications include (1) single-band, single-operator; (2) multiband, single-operator; (3) multiband, multi-operator. Power input is as stipulated in the regulations governing the licenses of the operator. The contest call is "CQ SEA" for the CW contest and "CQ SEATEST" for the phone contest.

EXCHANGE:

RS/RST report plus serial numbers starting with 001 and increased by one for each successive contact. See also Rule 3(d).

SCORING:

1) For stations outside the SEANET area:

(a) Contact with stations within the SEANET area of the following prefixes (DU, HS, YB, 9M2, 9M6, 9M8, 9V1, V85)—20 points on 160 meters, 10 points on 80 and 40 meters, and 4 points on 20, 15, and 10 meters.

(b) Contacts with other stations within the SEANET area not listed above in 1(a)—10 points on 160 meters, 5 points on 80 and 40 meters, and 2 points on 20, 15, and 10 meters.

(c) Contact between stations outside SEANET area will not be counted.

(d) Multipliers will be 3 points for each country worked, i.e., for countries between SEANET areas only.

2) For stations in the SEANET areas:

(a) Contacts with stations outside SEANET areas—10 points on 160 meters, 5 points on 80 and 40 meters, and 2 points on 20, 15, and 10 meters.

(b) Contacts between stations within the SEANET areas—6 points on 160 meters, 3 points on 80 and 40 meters, and 2 points on 20, 15, and 10 meters.

(c) Contacts between stations in own country will not be counted.

(d) Multipliers—contacts with countries within the SEANET area count 3 points for each country worked.

3) The final score will be the sum of the *points* multiplied by the sum of the *country multipliers*.

The list of SEANET area prefixes is as follows: A4, A5, A6, A9, AP, BV, CR9, C21, DU, EP, HL, HS, H44, JA/JE/JF/JG/JH/JI/JR, etc., JD1, JY, KA, KC6, KG6/KH2, KH6, KX6, P29, S79, VK, VQ9, V85, VS6, VS9K, VU2, XU, XV5, XWB, YB, YJ8, ZK, ZL, 3B6/7, 3B8, 3D2, 4S7, 4X, 5W1, 5Z4, 8Q7, 9K2, 9M2, 9M6/8, 9N1, and 9V1.

Some restrictions apply, as follows:

(a) Contacts on cross-modes or cross-bands or mixed CW/phone logs will be disqualified.

(b) Operators are not allowed to transmit two or more signals at the same time.

(c) Only one contact per band with the same station will be counted.

(d) Contest numbers should begin with 001 on each different band.

(e) All entries in violation of the contest rules, incorrect statements in the submitted reports, taking points from duplicate contacts, and practices against the brotherhood of amateur radio will be disqualified.

(f) The decision of the SEANET Contest Committee shall be final.

ENTRIES, LOGS, AND SUMMARY SHEETS:

All entries must be in the form of logs and summary sheets. All time must be in GMT. Entries must be received by the Contest Manager, Eshee Razak 9M2FK, PO Box 13, Penang, Malaysia, not later than October 31, 1984. Results will be announced at the SEANET Convention. If you require the results to be sent to you, please enclose IRCs together with your entry.

CW COUNTY HUNTERS CONTEST

Starts: 0000 GMT July 28
Ends: 0200 GMT July 30

The CW County Hunters Net invites all amateurs to participate in this year's contest. All mobile and portable operation in less active counties is welcomed and encouraged. Stations may be worked once on each band and again if the station has changed counties. Portable or mobile stations changing counties during the contest may repeat contacts for QSO points.

EXCHANGE:

QSO number; category (P for portable, M for mobile); RST; state, province, or country; and US county. Stations on county lines give and receive only one QSO number, but each county is valid for a multiplier.

FREQUENCIES:

3575, 7055, 14065, 21065, 28065. It is strongly requested that only P or M category stations call CQ or QRZ on 40 meters below 7055 and on 20 meters below 14065 with all other stations spreading out above those frequencies.

SCORING:

QSOs with fixed stations are 1 point; QSOs with portable or mobile stations are 3 points. Multiply the number of QSO points times the number of US counties worked. Independent cities may be counted as any one of their adjoining counties in accordance with USACA rules. Mobiles and portables calculate their score on the basis of total contacts within a state for state certificate and calculate their scores on all operations if they operated from more than one state in competition for the High Portable or High Mobile Trophy.

AWARDS:

Certificates will be awarded in three categories:

1) Highest fixed or fixed portable station in each state, province, and country with 1,000 or more points.

2) Highest station in each state operating portable from a county which is not his normal point of operation with 1,000 or more points.

3) Highest station in each state operating mobile from 3 or more counties with a minimum of 10 QSOs in at least each of 3 counties.

Plaques will be awarded to the highest mobile and portable stations in the USA that meet the above requirements for certificates. Additional awards will be issued where deemed appropriate.

ENTRIES:

Logs must show category, date/time in GMT, station worked, band, exchanges, QSO points, location, and claimed score. All entries with 100 or more QSOs *must include a check sheet of counties worked or be disqualified from receiving awards.* Enclose a large SASE if results are desired. Logs must be postmarked by September 1 and sent to: CW County Hunters Net, c/o Jerry Burkhead N6QA, 7525 Baltic St., San Diego, California 92111.

*****

I recently received a letter from the Yukon Amateur Radio Association concerning VY1 participation in future contests. As a result of a recent group meeting, they are requesting separate multiplier status for the Yukon Territory, VY1, for the following reasons:

1) In most contests, Yukon and Northwest Territories are classed as one. The Yukon has no ties with VE8, political or otherwise. The VY1 prefix has been in existence for 6 years now, although most publications still think they are either South America or Sable Island.

2) It is discouraging to have many VE and W amateurs call and have no idea where the VY1 station is located, especially since most contest information still lists them as VE8.

3) There are no super stations in the Yukon. With the propagation anomalies they suffer at that latitude, they cannot compete with southern stations. They are relegated to just being on during the contest period for the sake of giving out the prefix.

4) They have made an effort to have at least 3 stations on in every major contest for the past 2 years. The main participants have just had about enough and are seriously considering following their preferred methods of operating rather than spending complete weekends operating contests without any hope of turning in reasonable scores.

I think the letter speaks for itself and future contest chairmen may want to reconsider their multipliers!

NEW PRODUCTS

AMATEUR RTTY/ASCII/CW TERMINAL

ColoRadio Research, based in Loveland, Colorado, has announced the Model 900B Advanced Keyboard, a totally expandable amateur-radio RTTY/ASCII/CW terminal. It can be interfaced to a variety of computers via its RS-232C port and can be expanded to include a high-quality built-in keyboard, 16-character LED display, and/or 80-character-by-25-line high-resolution video interface.

The unit sends and receives Baudot and ASCII codes at all standard baud rates from 45 to 110 and can transmit at up to 1200 baud. The RS-232C port can handle up to 9600 baud with CTS/RTS, Xon/Xoff, or no handshaking.

The Model 900B also has CW transmit and receive capability. The ColoRadio Surecopy I algorithm automatically adjusts to any incoming speed within a few letters and the hardware and software signal processing minimizes garbled copy under even the worst band conditions.

Other functions include dupe-checking of up to 1280 calls, and touchtone™ and two-tone transmitter testing. The output *and* input tone frequencies can be changed at any time in 1-Hz steps, giving compatibility with not only current shifts of 170, 425, and 850 Hz, but also modem shifts of 200 Hz and any future shifts that may be used.

The unit interfaces easily with any amateur-radio station, with connectors for audio input and output, FSK, loop, autostart, key in, positive and negative key outputs, and video. A unique feature is the ability to multiplex the station microphone through the Model 900B to avoid having to switch cables when going from RTTY to SSB (useful on older transceivers that don't have separate mike and AFSK jacks).

Standard features include an 800-character type-ahead transmit buffer with break capability and buffer recall "pointers" that give an effective transmit-buffer capacity of 64,000 characters, ten 80-character message buffers, an 80-character WRU buffer, CW ID capability, 10,000-character receive buffer with scrolling, split- and full-screen display, complete status indications showing date/time, word mode, brag-tape status, diddle, sidetone, column number of automatic carriage return/line feed, operating mode, speed, tuning indicator, USOS, polarity, and frequency of transmit and receive tones. The dupe-check function has nicad battery backup to allow the user to return home from field contests and dump the stored calls to a computer or printer.

Inquiries should be mailed to *ColoRadio Research, PO Box 603, Loveland CO 80539; (303)-667-7382*. Reader Service number 477.

MICROCOMPUTER LOGGING PROGRAM

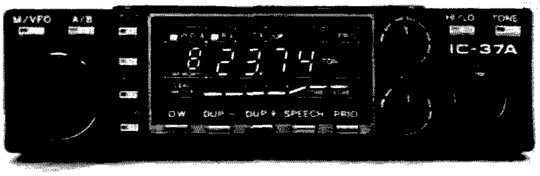
Crumtronics has announced Contender, a logging program for the Commodore 64 microcomputer.

On a single-sided disk you can enter 2,000 entries, allowing callsign, RST sent/received, time/date (auto or manual), name, QTH, zone, and QSL information for each entry. Contender permits forward/reverse scan, has an edit/update feature, and allows you to PRINT: dupe sheet to printer or screen, QSL labels, QSL cards, and complete log.

Contender is being expanded to include allband WAS, WAZ, DXCC, and state/county report. The expanded version will be known as Contender Plus and will be priced slightly higher.

For more information, write to *Crumtronics, Software Division, PO Box 6187, Fort Wayne IN 46896; (219)-745-0350*. Reader Service number 481.

IC-37A 220-MHZ MOBILE



IC-37A mobile transceiver.

Icom has announced the IC-37A 220-MHz compact mobile transceiver. The IC-37A features:

- 25 Watts/5 Watts low
- same design as IC-27A—5½" W × 1½" H × 7" D
- 32 PL frequencies—standard, built-in
- 9 memories with offset and PL storage
- dial steps: 10 kHz/5 kHz
- memory scan, band scan, and priority scan
- dual vfo's
- HM-23 touchtone™ and scanning mike standard
- speech-synthesizer option
- Nor/Rev switch

For more information, contact *Icom America, Inc., 2112 116th Ave. NE, Bellevue WA 98004; (206)-454-8155*.

60-MHZ SCOPE FROM KIKUSUI

A new 60-MHz oscilloscope, featuring peak-to-peak automatic triggering and automatic focus was recently added to Kikusui's line of oscilloscopes.

Other key features of the scope, model 5060, include delay sweep, delay line, alternate sweep, a third channel signal, and a vertical-signal output on the back of the unit. Sensitivity is 1 mV with 5× magnification. The scope also includes a sync separator as standard.

In addition, a variable hold-off allows precise adjustment of trigger hold-off time, ensuring stable triggering on complex or long waveforms. Auto triggering and peak-to-peak auto triggering, on the other hand, ensure stable triggering at all input amplitudes. The built-in delay line allows accurate leading-edge measurements. Also, a two-channel X-Y operation is included.

The CRT of the 5060 is a 6" rectangular with 12 kV of accelerating potential to provide a clear, bright display, and automatic focus even when intensity is adjusted or the sweep rate is changed.

The unit is small, measuring 6.9" H × 11" W × 14.6" D. It weighs just under 16 pounds.

Ac voltage is selectable: 100, 115, 215, or 230 V, 50 or 60 Hz. Power requirements are approximately 40 VA.

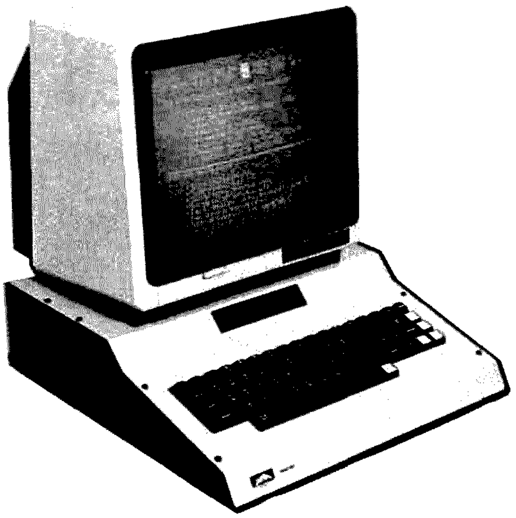
Applications for the 5060 include computer field servicing, industrial control, process control (e.g., the paper industry), food processing, and assembly lines.

"It fits two niches nicely," explained Bill White, vice-president of marketing for Kikusui. "One is field service where light weight is a prime consideration, and the other is production lines where KIK's automatic triggering simplifies and speeds operation."

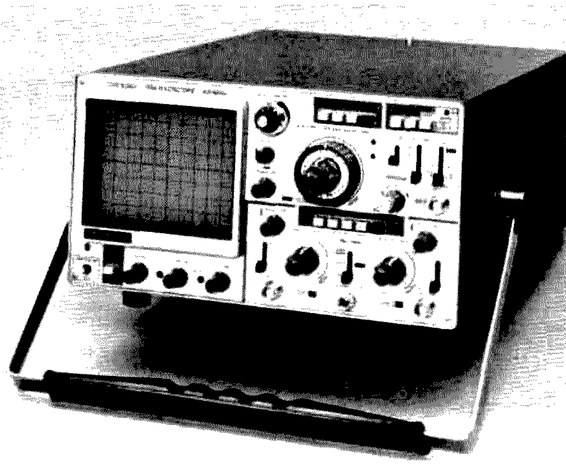
For more information, contact *Kikusui International Corporation, 17819 S. Figueroa St., Gardena CA 90248; (800)-421-5334*. In Alaska, California, and Hawaii, call *(213)-515-6432*. Reader Service number 476.

CONFINED E-FIELD DISPLACEMENT ANTENNA

Moler Antenna has produced a 16-foot, 80-meter vertical that enables any radio amateur to operate with a big signal from a small lot. It is motor-tuned at the loading coil to cover the whole band from 3.5 to 4.0 MHz. Fed with 50-Ohm coax, it handles the legal limit plus some and can be ground- or roof-mounted. The antenna is top-loaded with both inductance and a top capacity hat. The loading coil is wound with 3/8-inch-wide copper strap and the capacity hat has a diameter of approximately 8 feet. When ground mounting, a radial system of approximately 32 wires, about 25 feet long, is recommended. For mounting above the ground, at least 8 radials about 25 feet long, are recommended. The antenna requires 3 guy ropes. The assembly time is about 30 minutes. The loading coil motor is a 12-volt-dc reversible motor and can be driven easily by a 9-volt tran-



RTTY/ASCII/CW terminal from ColoRadio Research.



60-MHz oscilloscope from Kikusui.

sistor-radio battery. You can build your own control box or buy one from Moler. This antenna has a low wave angle, therefore, it works very well on DX. Two or more of these antennas can be phased easily by driving only one and using the others as parasitic elements, steering the beam in any direction by remotely tuning the mutually coupled antennas.

A conversion kit is available for the above antenna. It converts the 80-meter vertical to half-wave vertical. The conversion kit eliminates the need for radials and increases the height of the antenna by 3 feet (making the overall length approximately 19 feet). For more information, contact *Moler Antenna Corp., 2623 Morris Lane, Girard OH 44420; (216)-530-2059.*

HF ANTENNA DESIGN PROGRAM

HF Antenna Design is the latest offering in Cynwyn's software series for amateur-radio hobbyists. The program makes the necessary calculations for building three popular types of antennas—dipole, yagi, and quad—for frequencies of 1.8–30 MHz and displays them in an easy-to-read tabular format. Dimensions for the yagi and quad are optimized for maximum gain.

HF Antenna Design requires a TRS-80C Color Computer with 16K RAM and Extended Color Basic or an MC-10 with 4K RAM.

For more information, contact B. E. Wynkoop at *Cynwyn, 4791 Broadway, Suite 2F, New York NY 10034; (212)-567-8493.* Reader Service number 479.

NCG'S NEW TRIBANDER

The new tribander, 40–15 plus 6 meters, will give all amateurs, from Novice to Extra, a rig that will fill the gap. The 7-21-6M is all solid state with built-in ac/dc; no external power supply is needed. Full band coverage on 40 and 15 meters with 6-meter coverage from 50.0 to 50.50 MHz. All bands operate in the modes of SSB or CW. Drift-free operation is less than 100 Hz. Two antenna connectors allow bandswitching easily, one is for 6 meters and the other is for 15 and 40 meters. Transmitting final stage is 26 Watts PEP and modulation is a balanced type. Carrier suppression is more than 40 dB down. Microphone impedance is from 50 to 400 Ohms. With built-in TVI suppression for 6 meters, this tribander will be a pleasure to operate. With a slow swr on the 6-meter antenna, no or very little TV interference will be encountered. The 7-21-6M is an ideal transceiver for the Technician, phone on 6, and CW on 15 and 40 meters. The tribander is small enough to operate mobile and large enough for a base rig. The tribander should be available in July. For additional information, contact *NCG Co., 1275 N. Grove St., Anaheim CA 92806; (714)-630-4541.* Reader Service number 478.

SHACKMASTER

Advanced Computer Controls, Inc., has introduced ShackMaster, a new product which allows you to remotely control your shack and effectively communicate with family members over *your* home equipment.

ShackMaster's crossband linking capability allows you to access your high-performance home station from VHF/UHF, either simplex or through repeaters. Telephone access permits remote control of your home station from any touchtone™ telephone. BSR X-10 shack control offers touchtone remote control of 120-volt devices with touchtone commands, over the air or over the phone.

ShackPatch, a remotely controlled intercom into the home, permits you to remotely control your home equipment, allowing third parties to participate. ShackPatch is based on the same principles as an autopatch, and you are in complete control of your station at all times. An electronic mailbox permits you and your family to leave messages for each other, to be retrieved when convenient. Finally, a simplex autopatch is available when it's necessary to make a phone call, report an accident, or call a friend.

ShackMaster is based on ACC's proven repeater control technology. It includes electronic synthesized speech with a custom vocabulary. It interfaces to up to three transceivers, the phone line, and a local speaker and microphone.

For more information, contact *Advanced Computer Controls, Inc., 10816 Northridge Square, Cupertino CA 95014; (408)-749-8330.* Reader Service number 480.

ShackMaster from ACC.

MODEL CS-16 TOUCHTONE DECODER

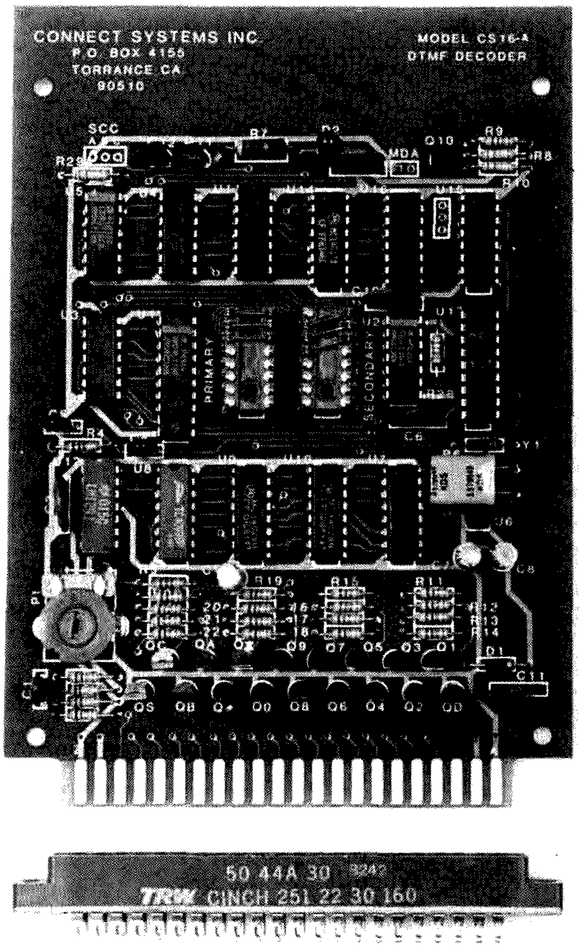
Connect Systems, Inc., has introduced a low-cost, 16-function touchtone™ decoder board. Designated as model CS-16, the decoder will securely control virtually any apparatus via radio or wire. The CS-16 is especially useful for controlling various repeater on/off functions.

One feature of the CS-16 is dual password control. Two separately user-programmable three-digit passwords create heirarchy control capability. The primary control password can access all 16 of the available functions. The secondary password, however, can access only 8 of the 16 functions. Additionally, a special primary password command is available which can enable or disable secondary password access. The CS-16 provides such a high degree of multi-level security that control can be accomplished directly on voice channels thus eliminating the need for separate control frequencies.

The CS-16 provides 16 independently controllable on/off latched functions. Each function is provided with an open collector and a 5-V CMOS logic output. A strobe output is also made available in open collector and logic format. This output can be used to gate repeated audio so that DTMF control commands are not retransmitted—a further security enhancement.

A power-up reset feature causes all outputs to be in the off state after application of power. An audio preamp with level control permits the crystal-controlled tone decoder to operate over the wide input range of 10 mV to 2 volts. A strobe LED lights when any of the 16 buttons on a pad is pressed. (The CS-16 can also be used with 12-button pads.) An on-board voltage regulator permits operation with a 10–25-V-dc power source. The CS-16 incorporates reverse polarity protection and draws less than 20 mA from the supply.

The CS-16 is constructed on a top-quality glass board with plated-through holes. The board is reflow-soldered and machine-trimmed. The 44-pin edge connector is gold plated for extreme reliability. The CS-16 is supplied with mating connector, manual, and limited six-month warranty. For more information, contact *Connect Systems, Inc., 23731 Madison St., Torrance CA 90505.*



New touchtone decoder from Connect Systems.

NCG's new tribander.

REVIEW

THE SUPER SANTECS—EVEN BETTER NOW

In last October's issue of *73*, I reviewed the Santec ST-/uP series of handie-talkies in glowing terms. Since then the importer, Encomm Inc., has introduced substantially updated versions of all three radios. The ST-144/uP, ST-220/uP, and ST-440/uP have been replaced by the ST-142, ST-222, and ST-442.

The good news is that, good as the earlier versions were, the new ones are better. The really good news is that Encomm hasn't forgotten all you buyers of ST-/uP radios: For a cost considerably less than that of a new radio, they will update your ST-/uP into the new model, as they have done for all three of mine. I can't remember any manufacturer/importer having done that before.

The changes in the new models affect the microprocessor operating system. The transmitter and receiver are unchanged, and both have the excellent specs that were published in my October review.

Programmable Offset

What's different? A whole lot. First and foremost, the transmit offset is now separately programmable on all ten channels! Think about that. If you use odd-split repeaters, or if you want to listen on your repeater's output but transmit on a control frequency, you can set up a channel memory for that purpose. In the ST-/uP radios, you could set up one, and only one, "special" offset, by receiving on the set frequency and transmitting on the frequency stored in memory 1. Now you can have a different offset in every memory channel if you want it! You can also use the variable offset feature in the "normal," i.e., non-memory, mode, and it will apply to whatever receive frequency you program in.

The offset is variable in 10-kHz steps (25 kHz on the ST-442), the maximum offset is 9990 kHz (9975 kHz on the 442), and the minimum offset is twice the minimum adjacent channel step (meaning 10 kHz minimum offset on the VHF radios and 50 kHz on the UHF one). Bear in mind that if your offset results in an out-of-band transmit frequency, nothing will happen when you press the push-to-talk bar.

If all this versatility isn't enough for you, as might happen if you wanted an offset not divisible by 10 kHz, the "old" setup of receiving on a selected channel and transmitting on a frequency stored in a "special" memory is still available. Memory 9 has replaced memory 1 for this purpose.

Programmable CTCSS

Still on the subject of "customized" channels, Encomm is offering a programmable CTCSS encoder for the new radios that will allow you to generate a different subaudible access tone on each of the memory channels. The encoder uses a PROM that you customize yourself. If you buy this accessory, you also get a little programming board which takes the PROM and uses any 12-V-dc source to program it as you desire. Then all you have to do is select the channel you want, and the correct transmit offset and subaudible tone frequency are right there automatically.

Status Memory

Variable offset and custom access tones are just the beginning. When you turned the ST-/uP radios off and then on again, they "woke up" on whatever frequency was stored in memory 1, but in "normal" (i.e., not memory) mode. This meant that when you finished a QSO and shut down the radio, then remembered you had something else to say, you would have to reselect the channel on which you had been talking (unless it happened to be the one in the first memory). No more! The new Santecs "wake up" in *exactly* the status they were in when you shut down—on the same memory channel or on the same normal mode frequency, whichever way you had it set up when you switched off. Incidentally, this eliminated the "bug" mentioned in last October's review, which related to use of the clock (yes, the clock is still there). Sometimes when I switched to the clock mode and back to the frequency display, I found the radio on the memory 1 frequency in normal mode, as though I'd shut off the power and turned it on again. That no longer happens, because interrupting the power doesn't affect the frequency/memory settings.

Scan Lockout

We're still not finished with the goodies list. On the ST-/uP radios, you could scan all or a set part of a band or you could scan the ten memories, with a priority feature for the memory 1 frequency. If you were scanning memory channels, you had to scan all ten, and the radio would stop on each one that was active. This meant that if you had programmed in, say, your three favorite repeaters, and six or seven more that you used only occasionally but wanted to have available, the radio would stop scanning on the less-interesting channels if they were in use, which introduced some delay in getting to the stuff you really wanted to hear.

Problem solved. The new radios have a "lockout" feature which can be applied to any channel. Select that channel, turn the "memory write" switch on, and press the "B" key. A small "L" lights up next to the frequency display, and that channel is locked out of the scan until you cancel the lockout. The locked-out channel is still available by keyboard selection, of course—it just won't show up in scan mode.

New "Open"ing

Speaking of scanning: Have you ever made use of an "open" scan feature which lets you scan for a quiet channel? In theory it's a nice idea, but in a country with a lot of repeaters, it isn't too useful. I can't ever recall using it, although all three of my ST-/uP radios had it.

Well, I'm going to start using "open" scan now, because on the new Santec radios it isn't what it used to be. First, a quick refresher course in Santec scanning is in order. You had (and still have on the new radios): "MAN"ual scanning, one frequency step for each press of the "up" or "down" keys, continuous if you hold either key for a second or so; "SCAN," stop on each busy channel, auto restart after 6 seconds or so; and "SRCH," stop on a busy channel, no auto restart. The new "OPEN" mode stops on each busy channel, but auto restart is delayed until the channel has been quiet for a few seconds. Using "OPEN," you can hear a QSO out to its finish, and then the radio will resume scanning. That's a useful feature, and to my mind much more so than the ability to scan for a quiet channel. Remember also that all the Santec radios have variable scan interval—5 to 100 kHz for the VHF units, 25 to 100 kHz for the ST-442.

Accident Prevention

On the ST-/uP radios, some care had to be exercised when programming memories. You set up the receive frequency on the display, set the offset switches the way you wanted, turned on the "memory write" switch, pushed the "write" key, and entered the desired channel digit. The problem was, if you accidentally pressed a second digit before turning off the write switch or pressing the write key a second time, the same frequency got written into another memory. Several times I forgot this, went into the "memory write" mode, and then entered the frequency I wanted. If I entered "673" (for 146.730 MHz), I got whatever frequency was on the display entered into channels 3, 6, and 7—overwriting anything that had been there before!

The new radios eliminate this problem. The act of storing a frequency in a memory channel automatically takes the microprocessor out of the write mode. The worst that can happen is that you get one wrong frequency stored, not three or four. A big improvement.

The new radios are identical in their external details to the earlier versions. The only obvious difference is the nameplate, which carries the new model number.

Updating Available

I said earlier that Encomm will update your ST-/uP radios. At his writing, the updating charge is $100—a lot less than the cost of a new radio. Your updated version will be identical in all respects to the new models and will accept the accessory programmable tone encoder. So you can have your ST-/uP made over into "this year's" radio instead of trading in the old one. Encomm hasn't abandoned you.

If you liked the ST-144/uP and its cousins, you'll love the ST-142.

For further information, contact *Encomm, Inc., 2000 Avenue G, Suite 800, Plano TX 75074; (214)-423-0024*. Reader Service number 482.

Robinson Market W2IVS
New York NY

WHAT DO YOU THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

ICOM'S IC-RP3010 70-CM REPEATER

In our efforts to escape from the crowded metropolitan-area 2-meter band, our club sought refuge on 440 megahertz. Such a move in a heavily populated area is fraught with its own perils. Our repeater site on top of a high-rise apartment building provides excellent coverage, but many of the commercial operators in the area have had similar feelings and installed (more than 20) commercial repeaters within several hundred feet of our site.

It was a difficult decision to select a repeater that would be cost-effective and yet sufficiently selective to be able to cut the mustard. A modern commercial repeater was out of the question because of cost, and the older commercial variety used by many of the other 440 groups in our area required PL™ to keep the intermod out.

The Icom IC-RP3010 seemed a likely candidate; however, we had difficulty obtaining any information on it. We finally decided that the Icom name and reputation was enough to go on and after some difficulty locating one in this country and arranging for its shipment, we were pleasantly surprised when we opened our new package.

The repeater cabinet is constructed of heavy-gauge metal and is completely shielded on both top and bottom. Both the transmitter and the receiver are mounted in rf-tight boxes with quick disconnect plugs to enable easy removal for service. The power supply has a trickle charger to keep a backup battery fully charged for emergency power, and the power-on light, normally green for ac operation, changes to red to warn of battery power. A large heat sink the entire width of the cabinet is installed on the rear to dissipate heat generated by the power supply and PA.

The controller, CTCSS, and touchtone™ decoder boards are mounted underneath the main chassis. The front panel of the repeater is anodized aluminum, very attractively finished with an easy-to-follow block diagram of the repeater controls embossed on its face. Volume and squelch, CTCSS on-off, transmitter inhibit, manual ID, and COR simulate are the only external controls on the repeater. Annunciator lights make it easy to determine the mode and status of the repeater. It is 19" rack width, but the mounting holes are metric and may not line up with all US racks (possibly requiring rack modification by drilling new holes).

We bought the repeater with the optional Icom mounting rack which allows approximately 12" below the repeater for mounting duplexers or other accessories. It makes the repeater very attractive; thus far my wife has not objected to its being in our apartment, where it serves as a table.

The repeater comes from the factory aligned on a Japanese repeater frequency in the 430-megahertz portion of the band, so our first step was to install the crystals we had previously ordered for our assigned frequency and then retune the transmitter and receiver. The Icom manual contains detailed instructions on all alignment procedures. However, as in most manuals translated from the Japanese by non-native-English-speaking writers, some of the instructions require a little careful thought before execution. The receiver and transmitter both tweaked up well within Icom specs. Squelch on the receiver opened at 0.1 microvolts, and the transmitter produced 14 Watts.

The control board "brain" is a factory-programmed EPROM which contains the settings for all the timers with the exception of the squelch tail and the repeater callsign. The EPROM must be returned to Icom to have the repeater callsign programmed in ROM. Perhaps Icom could make some arrangement to program the EPROM and tune the transmitter and receiver on the user's frequencies at the

factory before shipment so that the entire repeater would become a turn-key operation.

The machine is now up and running and producing excellent results. We are running it without a power amplifier, using Wacom WP-678 cavities, and are currently using about 115 feet of hardliner. The results have been excellent. The audio is typical Icom and is equal to or better than that of other repeaters. Intermod has not been a major problem and we have been able to operate with the CTCSS off with little intermod interference.

The CTCSS frequency tolerance seems rather broad, and mobile stations have been able to get in even if they were one or two codes away from ours.

The repeater comes with single-digit touchtone™ control for repeater and CTCSS on-off, and we have found that the decoder frequently falses on voice modulation, thus turning the repeater or the PL™ on and off at inconvenient times. The single-digit decoder can be defeated by inserting an included jack on the rear repeater panel or by installing the IC-EX339 3-digit decoder available as an option from Icom.

Unfortunately, no provisions for installing an autopatch have been included. However, interfacing any commercial autopatch should be a rather easy job.

In summary, I feel the IC-RP3010 is an excellent piece of equipment well worth its purchase price. As soon as more become available, it is going to make the 440-megahertz band a popular place.

For further information, contact *Icom America, Inc., 2112 116th Ave. NE, Bellevue WA 98004; (206)-454-8155.*

Keith J. Mackey W4LDP
Ft. Lauderdale FL

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

As I write this column, this year's Greater Baltimore Hamboree and Computerfest has come to a close. It is amazing to describe the changes that have become apparent within amateur radio over the past several years, as viewed from the perspective of a hamfest.

Not that long ago, the bulk of dealers at these gatherings were selling big boxy transmitters or receivers, or tubes or other parts by the bin. As far as RTTY went, you could usually find a Teletype® Model 15 or two, or maybe a Model 28 if you were lucky, but not much else of especial interest to the RTTYer.

With the coming age of digital communications, all this has changed! This year, I would estimate the average distance between keyboards as under three feet, and that is allowing for the still considerable number of non-RTTY or computer items being displayed. Walking around this giant hamfest (which takes over the Timonium Fairgrounds, home of our Maryland State Fair, every spring) and pushing through the thousands of folks who braved a cold rainy day to come pointed up many sights.

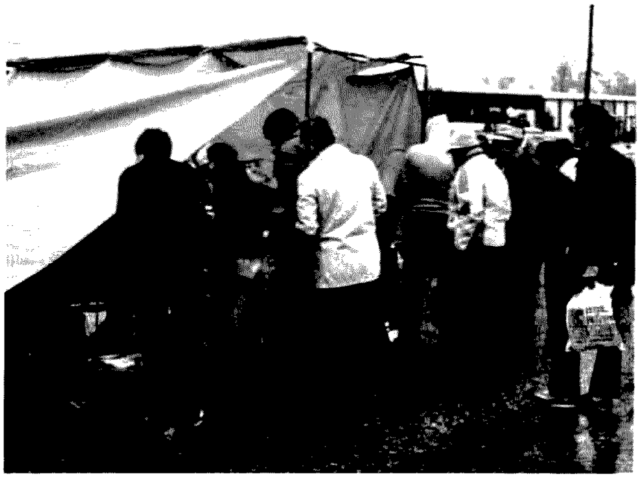
I found RTTY bargains aplenty, ranging from rolls of paper at giveaway prices to one gent offering a Teletype Model 33 for all of ten dollars. Computer manufacturers have not forgotten us either, folks. Just about every table had a computer set up to either run RTTY or serve some other useful function in a ham shack. Yes, RTTY is more alive than at any time in its history. Hmm, there is a topic for a future column—the history of RTTY!

At any rate, included in this month's column are a few choice photos taken at this year's hamfest.

At the risk of inundating Levittown with mail, I have a note here, the contents of which I must pass along. As of the date of this writing (the first week of April), Fred Weidenhammer W4SDL/2 indicates that he has a Teletype Model 35-RO, free to someone willing to pay shipping and insurance. This is a receive-only ASCII printer, and it does not have a cabinet. That is all I know. I would suggest you contact Fred for further details at 332 Blacksmith Road, Levittown, New York 11756.

More comments on the various programs to run RTTY on TRS-80 Models I and III have arrived. Bill Buckingham WA3LIL, who has written us before on the subject, passes along the information that the programs he uses operate through the I/O bus of these computers with an I/O interface. The Model I has a forty-pin bus and the Model III a fifty-pin bus, so there are a few differences between them, but apparently they are not insurmountable. Bill also indicates that work is under way to adapt these programs to the new TRS-80 Model 4. Thanks for the information, Bill.

Along the same line, regards to Richard Ellers K8JKL of Warren, Ohio. Richard is trying to put his TRS-80 Model III onto RTTY and is looking for software. I have put Richard in touch with Bill and hope to see him on RTTY very shortly.



The outside tailgating area, showing mostly the rain and tents.

Duane Vincent KA7JEX from Seattle, Washington, passes along his comments with regard to running a Texas Instruments TI-99/4A on RTTY. Using one of the popular interfaces available, Duane is very pleased with this setup. He notes that the keyboard touch on the 99/4A is not unlike that of the IBM terminal he uses at work.

Duane has also used a VIC-20 on RTTY. He uses that computer for portable RTTY out of his van. Boy, that brings back a picture in my mind of a vehicular station set up locally some years ago by W3DTN, complete with a mobile Model 15! Well, Duane prefers the 99/4A keyboard to the VIC, but he likes to run the VIC on the mobile 12-V-dc battery power. Yes, sir, things are moving along!

Another Commodore patron is Allen Fugelseth WB6RWU. Allen is using a Commodore 64 computer and is looking for, as he puts it, "free or inexpensive software." Well, I have not seen anything that quite meets that description, but I will keep my eye out. Part of the problem, Allen, is that I try not to recommend products that I have not seen or that I have not received other detailed information about from a source other than the manufacturer. There have been a few "lemons" dangled in there with the other fruits and such, and I would rather avoid them if I can. Will keep you and the rest of the fan club posted on new software as the information arrives.

New members of the CoCo club include Bruce T. Brackin of Oklahoma City, Oklahoma, and Peter G. Pototsky NH6BF of Kailua, Hawaii. Bruce is an SWL with an interest in putting his CoCo to work receiving the RTTY he hears on the air. I have forwarded the information covered in the last few months here to him to help in these efforts. Bruce asks if I have noted any computer-generated rf problems as-

One of the highlights of the hamfest was a look at the FCC mobile monitoring van.

One of the indoor flea-market areas at the Greater Baltimore Hamboree.

sociated with the CoCo. He notes that his "Osborne I will tear the National (NC-400 receiver) to pieces, and just about anything else within about 100 feet of it." Well, Bruce, I have not noticed any RFI at all with the CoCo, and I think that is a tribute to careful attention being paid to those design features which minimize "leaks." I don't know why your Osborne is causing problems; I have several friends who are using theirs without interference. Would suggest you check out your grounding in the station to be sure that a floating ground or the like is not the culprit. Who knows, you may hear enough RTTY to want to get a license and join us!

Peter, when he is not basking on the beaches in Hawaii (do you know how miserable the weather in Maryland is this time of year?), is trying to put his CoCo on RTTY and would like a disk-based program to do it. Well, at this time, I know of no disk-based program that exists. I have indicated to Clay Abrams that upgrading his excellent tape program would be ideal, and he has related the intention of doing just that, but these things take time. In the meantime, you might drop Clay a line at 1758 Comstock Lane, San Jose, California 95124. Tell him that WA3AJR said to bug him for a disk program!

Well, response to my offer for some basic RTTY material has been gratifying. Therefore, I am now preparing a second edition of RTTY material. This stuff was covered here several years ago and is being re-presented for those who came in late, forgot it, or whatever. Issue number one dealt with the basics of RTTY data exchange; number two shall deal with the essentials of the RTTY code structure, primarily Murray and ASCII. These are several pages of information, offered at a cost of $2.00 each. If you would like either of these editions, just drop me a line at the above address and include a self-addressed, stamped envelope and $2.00 for each issue desired. I will continue to put more of this information together as time permits and demand persists.

DX

Chod Harris VP2ML
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Santa Rosa CA 95402

DXING IN JULY

July. The lazy, hazy, noisy days of summer. High absorption batters down the higher bands, while summer thunderstorms fill the lower bands with deafening static crashes. Even the usually productive sunrise and sunset operating times are short and dull. Let's face it: July is not the best month for DXing.

So what's the DXer to do for the month of July? Take a month off from DXing? Maybe get to know the family again, before the bands start to pick up again in the fall? If you do that, of course, they'll start to expect you around the house, and it will be even harder to lock yourself into the radio shack for the start of the next DX season.

Fortunately, there are plenty of DX-related activities well suited to the dog (if not Dog X-ray) days of summer.

Antennas

The first thing that comes to mind is antennas. July offers an excellent time to review your DX-antenna farm. What worked last season? Will that antenna be good enough for the next DX season? With the decline of radio propagation, you might consider improving your low-band aerial hardware; 40, 80, and 160 meters will be hopping the next few winters. Meanwhile, the DX pickings on 10 meters will be few and far between. Even 15 meters will provide but sporadic excitement for the mid-80s. So think low bands, long dipoles, inverted vees, zepps, verticals, and ground planes.

If you are fortunate enough to have sufficiently tall, properly-spaced trees on your property, July is a good month to break out the bow and arrow or fishing rod and stick up a few wires and strings. So what if the neighbors think you're a little soft in the head, fishing in trees. Murmur something about flying fish and air sharks; they all think you're crazy to be a DXer anyway.

What kinds of antennas should you get up for the low bands? The bigger the better, of course, and height helps too. Vertical antennas seem to work better on the lower bands, if you can provide a reasonable ground. (We'll talk more about the low bands and DX antennas in a future column. Meanwhile, watch for bargains in lots of wire, and try to figure out how you are going to squeeze a 160-meter dipole onto your city lot.)

Paperwork Is Never Finished

DXers whose antennas are already big enough (if any) and those whose financial, environmental, or family circumstances preclude better antennas, might make use of the month of July by catching up on their DX paperwork.

Review your DXCC totals, QSLs sent and received, and your "need" list. The new DXCC Countries List from the ARRL provides a good place to tally your present worked/confirmed totals. This multi-page pamphlet provides columns for all HF bands and for many of the other DXCC awards, such as RTTY bands and satellite. Three drawbacks with the new listing are: no spaces for new and changed countries within the listing, no place for band totals, and the cost—now $1.00 postpaid from ARRL.

Do you have any countries worked but not confirmed? Take some time in July to follow up those QSLs. If you wait too long to confirm after the contact, the chances of getting your card decrease. So, if you have cards outstanding to QSL managers and in other direct methods, see if a follow-up note might be in order. Of course, if you are awaiting cards via the QSL bureau, don't hold your breath; it might be years before you receive your cards.

If you do decide to send reminders or second requests for cards, check the current callbooks, QSL-manager lists, and DX bulletins for the most recent QSL information.

Two fortunate readers of the column can turn to their complimentary subscriptions to weekly DX bulletins (see this column, January, 1984). In the drawing held earlier this year, the awards and lucky readers were: *The DX Bulletin* (Box DX, Andover CT 06232) to John Holstead VS6HJ, and *QRZ DX* (Box 834072, Richardson TX 75083) to Ray Perkins KA2PSW.

Congratulations to both! And for the rest of you DXers who didn't win the free subscriptions, you can keep up with the day-to-day activities in the DX world by taking out your own subscription—see the address above. It's hard to have too much information in DX!

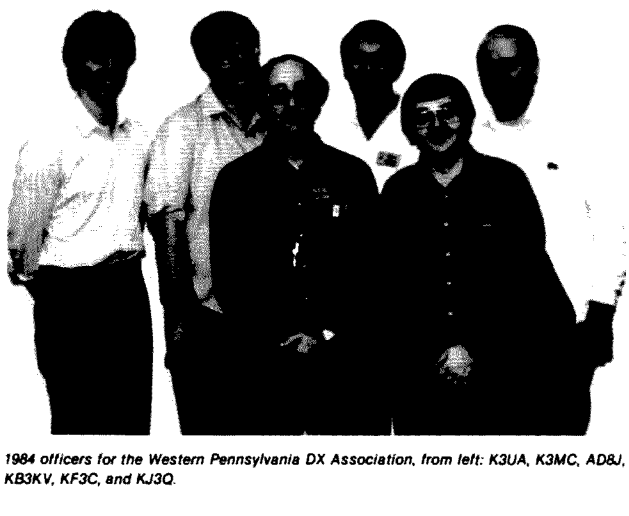
Another source of up-to-date DX information is your local DX radio club. Through meetings, newsletters, and DX-oriented repeaters, club members share ideas and locate the rare ones. And clubs provide assistance with Beam Teams and Quad Squads to repair damage from last winter's storms and put up even bigger aerial hardware.

These DX radio clubs depend on the interest, expertise, and enthusiasm of the members of the clubs. The club officers devote many hours of their time to provide programs, speakers, events, and camaraderie for the club. Too often when an officer asks for help with a club project, his efforts are rewarded with dead silence.

So, if you're not already a member of a local DX club, consider joining. If you are a member now, speak up the next time the club needs something done; help your fellow DXer. And if you already are active in your DX club, think about running for club office next time and share your energy to improve the DX world.

Among those who are doing just that are the officers of the very active Southeastern DX Club, centered in Atlanta, Georgia. Officers for 1984 include President Carl Hanson WB4ZNH, Vice-President Grover Meinert KC4BX, Treasurer Carol Shrader WI4K, Secretary Joel Levine WA4HNL, and Activities Chairman Jim Steible K4DLI.

The Western Pennsylvania DX Association's officers for 1984 are: President John Getz AD8J, Vice-President Phil Koch K3UA, Secretary Wayne Albert KB3KV, Treasurer Don McDanial KJ3Q, DX Information Chairman Denny Brantner KF3C, and (newsletter) Editor Mike Chepponis K3MC (see photo).



1984 officers for the Western Pennsylvania DX Association, from left: K3UA, K3MC, AD8J, KB3KV, KF3C, and KJ3Q.

Also on the east coast is the newly-founded Connecticut DX Association. That association's officers are: President Ron Richards WB1EAZ, Vice-President Paul Shafer KB1BE, and Secretary/Treasurer Tom Le Clerc WB1CBY.

And in the center of the country, the dynamic and interesting Kansas City DX Club sports the following for the 1984 slate of officers: President John Chass WØJLC, Vice-President Bill Henderson KØVBU, Treasurer Tom Bishop KØTLM, Secretary Steve Gecewicz KØCS, and (newsletter) Editor Mike Crabtree ABØX.

Congratulations to all these and other DX club officers. And for the rest of you: Isn't it time you did your part to make your DX club interesting and helpful?

Operating Events

No matter what other, nonoperating activities the DXer finds to while away the month of July, nothing provides quite the same satisfaction as getting on the air and working DX. Fortunately, despite the lousy band conditions, a couple of operating events help stir up the DXers in the heat of the summer.

The most popular on-the-air activity in July is the International Amateur Radio Union (IARU) Radiosport competition, the weekend of July 14-15, 1984. (See the "Contests" column in this issue, and see the rules in the May issue of *QST*.) Briefly, you try to work stations in different International Telecommunications Union (ITU) zones, *which are not the same* as the *CQ* magazine zones for their contest and awards program.

The Radiosport rules (assuming no major changes from previous years—check this) provide a heavy premium for working stations on different continents. In addition to the possible new zone multipliers of these stations, each contact with a station on a different continent counts five times as much as a contact within one's own zone. So the emphasis is on DX contacts.

The rule structure of this contest brings out many DX stations, anxious to fight the low Maximum Usable Frequency and high noise levels to work each other and maybe even you! The eastern Europeans and Russians are especially fond of this contest, and Radiosport provides an excellent opportunity to contact many of these stations.

The 1984 Radiosport contest will be quite different in at least one way: Many of the Russian stations will be sporting new callsigns, thanks to a major revision of the Russian callsign system this spring. All the radio club calls in the Soviet Union and many individual callsigns will be different. And unlike the FCC callsign "reform," in the USSR the callsign will give the location!

Here's how the system will work, with thanks to the *Murphy Message*, the newsletter of the Murphy's Marauders radio club:

The *first* letter of the callsign will be U or R. (Ten-meter fans are familiar with the low-power RA prefix stations from the USSR.) The *second* letter will indicate the republic: A for RSFSR, B for the Ukraine, etc. This is similar to the present system, but the procedure will be used for *all* calls in the republic, including club callsigns, which presently have a UK prefix. The number in the call will no longer be fixed, as now. If you hear UB, you won't be able automatically to add a 5. UB calls will be issued with any numeral, and the same with all the other republics, UI8, UL7, UF6, etc. The *third* letter (directly after the numeral) will help identify the oblast, or location. The *fourth* letter will be anything except W through Z, which are reserved for club stations. There might be a fifth letter in some areas. For example, UB3BDS would be a Ukrainian in the Ternopol oblast. Just to confuse things, some of the older two-letter suffix calls (issued before 1970) will stay the same.

In that part of the world, where amateurs must build their own gear and individual amateur licenses are relatively few and far between, the club stations account for much of the operating activity. In every contest, the big-gun clubs, such as UK2BBB, provide the little-gun DXers with their best shot at working the rarer Soviet republics. All these clubs now operate under new callsigns without the familiar UK prefix. Club stations will be identified by the last two letters of the callsign: WA through ZZ. So a club station in the Ternopol oblast might be UB8BZZ. (In RSFSR, UA1-4, 6, 9, and 0, club calls will have a UZ or RZ prefix.)

Bob Hess KA3EAL does his DXing from this compact station in Penns Creek, Pennsylvania.

Meanwhile, we hear that the French are jumping on the new callsign bandwagon. According to *Les Nouvelles DX*, the present F1 calls will change to FC1 and FD1. F2-F9 calls will emerge as FD2-9 and FE2-9. Corsica Island calls, now sporting an FC prefix, will be TK1-TK4. Other French overseas departments (Martinique, etc.) probably also will change.

All of this callsign switching will be confusing for a time, but it will make the prefix hunters delirious! Dozens of new prefixes will be on the air this summer, most never heard before—another excellent reason to keep up with your DX reading.

Another operating activity in July is the annual French Polynesia Tiurai. Listen for Tahitian stations July 14-21 on the following frequencies: 28600, 21300, 14240, 14180, 7090, and 3800, especially between 0200 and 1000 UTC. The stations will be celebrating their annual festival with a special certificate for working at least three Tahitian stations on at least two different bands. Send your log data and 12 IRCs to Tiurai 1984 Certificate, CORA, BP 5006, Pirea, Tahiti, French Polynesia.

The station that works the greatest number of French Polynesian stations during the festival week will win a handsome trophy: a beautiful engraved mother-of-pearl shell. (Thanks to Russ Forbes WB6GFJ/FO0FB for this news.)

DX Convention

By now, your month of July should be well-filled with DX activities. But if you are still yearning for more, take heart: There's a way to wrap up the DX month in fine fashion. The Northwest DX Convention will be held July 27-29, at the Greenwood Inn in Beaverton, Oregon, just outside of Portland. For more information on the convention, contact Bob Herndon W7XN, Willamette Valley DX Club, Box 555, Portland OR 97207. Who knows, you might even meet the DX editor of *73* magazine there!

So before you decide that the entire month of July is a complete waste, DX-wise, tune up those antennas, work the new Russian prefixes, hang your Tiuria certificate on your wall, and have a few eyeball contacts at the DX convention. And, yes, say hello to the family sometime during the month, so that they don't consider you a *complete* stranger!

LETTERS

OH, HE *NEEDS* HELP!

A number of others are working on wild and imaginative conversions and end up seeking help from those who have already done it. Perhaps someone will be able to provide me assistance as well?

Does anyone have instructions for converting a military surplus ARC-5/T-19 into an allband, all-mode, synthesized transceiver with automatic antenna tuner built-in? If possible, I'd like to replace the 1625 tubes (hard to find) with more common 3-500Zs for full legal power, and transistorize the rest. It should have at least 16K of memory and search/scan capability with priority channel lock-out—at least on all bands above 30 MHz. Oh yes, unless a key jack is included I probably won't be interested. Oh, one thing more: I'd like to be able to use it also as a vacuum cleaner, LNA for satellite TV reception, and wattmeter—at the flip of a 4-position switch.

Anyone who has already done this mod, please send me an SASE; I'll tell you how much you owe for photocopies. Thanks. *73.*

Robert (50-Ohm Bob) Wheaton W5XW
San Antonio TX

HATS OFF AND SALUTES

About 5:00 pm on Monday, April 9, 1984, during a brief trip to California to analyze a budding computer manufacturing company, I was enjoying the California sun in the beautiful backyard of the home of the friends with whom I was staying. Stripped to my shorts, I was stretched out listening to the chatter of happy people on my 2-meter hand-held when I was brought upright hearing, *"Mayday! Mayday! This is KE6HI. Mayday! I need a local contact fast!"*

My first reaction was to answer the distress call, but being pretty unfamiliar with the area, I waited an instant to see if a local would answer. My hunch was right for only a few seconds later I heard, *"KE6HI this is KF6TF. You are loud and clear. State your emergency. This is KF6TF. The handle is Dora. Go ahead."* The message was transmitted in a calm, precise, and authoritative manner.

From my notes taken at the time, here is what apparently happened thereafter. KE8HI, handle Alma, driving on Interstate 5 in heavy traffic during rush hour was following at a fair speed behind a motorcyclist when the cyclist crashed and was thrown onto the pavement and appeared to have a broken leg. The cyclist was at the mercy of the speeding traffic, and KE6HI, instead of swerving to pass the cyclist, chose to slam on her brakes and park in the middle of the freeway in a way to protect the downed cyclist from the certain dangers of oncoming traffic. After positioning her car in a protective position, turning on her flasher warning lights, and assuring herself that the injured cyclist would not be further injured, KE6HI sent out her Mayday call. After passing the pertinent information to KF6TF, KF6TF contacted the authorities and within ten minutes had the police, the fire and rescue team, and an ambulance at the site of the accident. While waiting, KE6HI directed traffic until the police arrived and took over.

Two fine California ladies doing a splendid job, excellently executed in a professional way: Alma Bourhenne KE6HI from Cardiff by the Sea, and Neldora Tuttle KF6TF from Escondido. I was most impressed with how well they did a volunteer job. I think they probably saved the life of the cyclist. Wouldn't it be nice for some of you to send each of them a QSL card just saying, "Well Done!"

Yes, a commendable job done by two fine ladies who know how to handle themselves with courage, efficiency, and dispatch under extreme emergency conditions. I was so proud of their performance that I hardly could wait to get home here in Washington State so I could tell my lovely wife all about it. My wife? Yes, she just got her Novice call, KA7RXM, and I'm mighty proud of her, too!

Christian L. Engleman W7QQ
Washougal WA

DX WORLD

Recently a program I wrote appeared in *73* (February, 1984), "Put the DX World On the Screen." I would like to thank all the many people who wrote me with their comments, suggestions, and their orders. The real pay in doing a project like this is the thanks that I receive from all my fellow hams; lord knows the money isn't worth it. I hope that all the people who received my program were pleased with what they received.

As many people already know, I did a rewrite of the Prefix Locator program for the Commodore 64. I added many features to it that you will not find in the VIC version. Let me list some of the added features.

- A more expanded data list, including cities and all the states in the US of A.
- Two clocks, one local and one GMT.
- User-selectable screen, border, and print colors.
- An MUF forecast in local time and GMT time.
- Printer output routines.
- A machine-language data-search routine. Now data searches take three to five seconds instead of three to four minutes.
- And, recently added, is a sunrise and sunset calculation routine.

This version is available from me or from RAK Electronics. The C64 version is available on tape or disk. A C64 version of one form or another has been available since November, 1983. The C64 version has been updated several times and some older versions don't have all the features mentioned above.

Eugene Morgan WB7RLX
1311 Cross St.
Ogden UT 84404

COME TO THE FAIR

A working amateur-radio station with space-age equipment, an international message-sending service, and the Smithsonian Institution's Marconi exhibit, will demonstrate amateur radio's role in worldwide friendship.

The Louisiana Amateur Radio Exhibition's booth at the Julia Street exit will outline amateur radio's heritage from the experimental days of radio wizard Guglielmo Marconi to disaster communications such as during Gulf Coast hurricanes, the current era of amateur-radio space communications including astronaut Owen Garriott's amateur-radio experiments from the space shuttle *Columbia* last year, and speculation on the hobby's future.

Operators will demonstrate how ama-

teurs communicate today, including the newer modes of color slow-scan television, radio-teleprinter, and computer and space satellite methods, and the standby, Morse code.

Visitors from the world's fair countries of the United States, Canada, Australia, Israel, Liberia, and Peru may send free messages to friends in their countries from the booth, via the hobby's international message system.

Among Marconi's relics on display through mid-August will be a rotary spark-gap transmitter used by early amateurs and a magnetic detector used by radio stations in 1912.

Visiting amateur-radio operators will be allowed to use the station on presentation of their licenses. They will identify themselves with the station's callsign, K5WF, which belongs to Howard T. DeLaneuville of Jefferson, Louisiana.

A unique verification card will be provided to amateur-radio operators who contact the stations and to shortwave listeners who describe hearing it. The QSL is being designed by John Chase, New Orleans historical cartoonist.

The Historic New Orleans Collection is providing a full-time curator, Patricia Tusa (XYL of Nick Tusa K5EF), to watch after the Marconi exhibit, which is being provided through the Smithsonian Institution Traveling Exhibition Service.

Marconi's daughter, Goia Marconi Bragga, has indicated that she would like to visit the exhibit. Plans are being made to have her come in June.

Amateur-radio equipment manufacturers are lending American-made products for use at the booth. Local volunteers have been constructing and designing the exhibit. Many volunteers will be needed to man the booth for the six-month show.

John J. Uhl KV5E, President
Louisiana Amateur Radio Exhibition, Inc.
New Orleans LA 70124

AWARDS

USS COD DXING

NOARS and the *USS Cod* will be on the air again this summer. Northern Ohio ARS members will be operating from the *Cod* starting Memorial Day weekend running daily through Labor Day weekend. Look for operations in the lower portion of the General bands 10 through 80 meters, with special Novice operations on June 16, July 15, and August 18, and Extra operations during the Cleveland Hamfest, September 23rd.

QSL cards picturing the *Cod* and NOARS station will be sent out confirming all contacts, a special 8 × 11 certificate will be available upon request with QSL confirming the two-way contact and $1.00 for handling and postage. Send all QSLs to WD8RZG.

The *USS Cod* is on permanent display as a war memorial to honor the men of the Silent Service and is located at the port of Cleveland between East 9th Street pier and Burke Lakefront Airport. Guided tours given daily. So come on down for an historic visit into the past for an adventure to remember.

BARC CERTIFICATE

A handsome new amateur operating certificate is now being offered by the Bartlesville (Oklahoma) Amateur Radio Club. The purpose of the certificate is to focus attention on the interesting "Green Country" region of northeast Oklahoma, and to emphasize the varied operating activities of the nearly 200 amateurs within that area.

The Green Country award is available to anyone making two-way amateur-radio contact with three hams in the Nowata, Osage, and/or Washington Counties of Oklahoma. All bands and modes are permitted. The certificates will be numbered and issued serially.

Applicants for the award should submit calls and pertinent details of their three qualifying QSOs, plus a $1.00 handling fee. QSLs are not required. Applications should be mailed to W5NS Awards Manager, 1800 Moonlight Drive, Bartlesville OK 74006.

2000TH ANNIVERSARY

To celebrate both the 2000th anniversary of the founding of Trier, Germany, and the 60th anniversary of the New Trier High School ARC, a certificate will be awarded to any amateur contacting a station in *both* Trier and New Trier Township, Illinois (includes the villages of Wilmette, Winnetka, Kenilworth, Glencoe, and Northfield). Contacts must be made in 1984, any band, any mode.

Send QSLs for both QSOs to New Trier H.S. ARC, W9EDC, New Trier H.S., Winnetka IL 60093, along with a large SASE, 54 cents US postage, or 4 IRCs for a non-folded certificate.

To assist amateurs in earning the award, special-event stations will be operated simultaneously from Trier (DL0TR, DL0BBS) and New Trier (W9EDC) on June 30th and July 1st. Operation will be 80–10 meters (SSB and some CW), 15 kHz above General band edges. DL0TR and DL0BBS will also go RTTY and OSCAR 10.

THUNDER ON THE OHIO

The Tri-State Amateur Radio Society (TARS) will operate a special-event station in conjunction with the Freedom Festival and Thunder on The Ohio Hydroplane Races during the Fourth of July weekend.

The station will use the club call W9OG (W 9 Old Glory) which is very appropriate for July 4th. Operations will begin on June 30, 1984, and continue daily through July 4, 1984. Hours of operation will be 10:00 am to 5:00 pm CDT in the lower portions of the Novice and General segments of the 10-, 15-, 20-, 40-, and 80-meter bands. All modes will be used including RTTY.

An attractive 8 × 10 certificate will be available for $1.00 postage to confirm contacts with the station. Certificates will be packaged flat and be suitable for framing. For those who do not wish a certificate, a special QSL card will be sent confirming all contacts. Please include 20¢ postage for the QSL card.

Send QSO information to TARS Special-Event Station W9OG, Attn: M. G. Anderson, PO Box 3284, Evansville IN 47732. For additional information on the special-event station contact me by phone: (812)-424-2306 (days) or (812)-476-5572 (evenings), or write asking to be placed on our publicity mailing list.

STEAM ENGINE CONVENTION

A special-event station will be operating July 13–15 from the Bourbon County Fairgrounds in Bourbon County, Kentucky, to commemorate the annual steam engine convention. This station will be operating with the call of WD4GPO, in the General phone and CW portion, with some Novice activity planned. All amateurs and SWLs working this station during this time can receive a commemorative QSL card from the Pioneer Amateur Radio Club of Winchester, Kentucky; send an SASE to Pete Clough WD4GPO, 425 Bell Street, Paris KY 40361.

SPEEDWAY STATION

The Adrian Amateur Radio Club is having a special-event station, W8TQE, at the Michigan International Speedway (MIS) on July 20, 21, and 22. The frequencies will be 28.625, 21.360, 14240, 7240, 3900 ± QRM. The Novice bands up 10 kHz, 21.110, 7.110, 3.710. This is to celebrate the Michigan 500 Indy-type car race. A special certificate will be offered. Send a large SASE to Adrian Amateur Radio Club, PO Box 26, Adrian MI 49221.

DETROIT ARSENAL

The Tank-Automotive Command ARC will operate W8JPW on July 21, 1984, from 1300–2000Z to commemorate the 43rd year of the Detroit Arsenal, home of the the US Army Tank-Automotive Command. Frequencies: phone 7.274, 21.400, and 146.49 MHz; and CW 7.055 from 1500–1700Z. Put your QSO number and frequency in upper-left corner of outer envelope. Send 9" × 12" SASE for unfolded certificate; otherwise, SASE to: W8JPW, US Army Communications Command, Attn: CCNC-TAC-M, 28251 Van Dyke, Warren MI 48090.

BERNE SWISS DAYS

The Adams County ARC will operate KC9TZ from 1400Z July 27 to 2200Z July 28 to commemorate Berne Swiss Days. Operation will be 15 kHz above the bottom of the General phone band on 20m and 40m, and the Novice band on 15m and 40m. QSL to the *Callbook* address for a decorative certificate.

DR. DIGITAL

Robert Swirsky AF2M
PO Box 122
Cedarhurst NY 11516

BITS AND PIECES

I have an old Apple II computer. According to the date stamped on the circuit board, it was manufactured in late 1979 (I purchased it in early 1980). In the four years I have had it, it has performed flawlessly—until just recently.

The P and the L keys started to

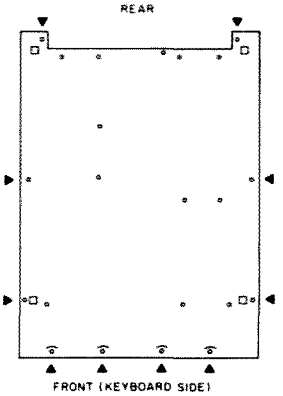


Fig. 1. Underneath an Apple. Arrows indicate screws to remove.

"bounce." Sometimes I would get two or three Ps or Ls when I only wanted one. I ran over to a local computer repair shop and purchased 2 keyswitches. When I returned home, I had to figure out how to take the Apple apart to get at the keyboard—a task that isn't too difficult if you know which screws to remove! To save you from possible aggravation if the need ever arises to take *your* Apple apart, I will describe how it is done. Please note that this information only applies to Apple II computers; Apple *//e* computers are *constructed differently.*

Start by disconnecting the power cord from the computer. Pop the lid off and carefully disconnect all the peripheral cards, disk connector cables, etc. Unplug anything you might have plugged in the game port or the rf modulator socket.

Look at the diagram in Fig. 1. Turn your computer over and set it down on a protective surface. Remove only those screws that are marked with an arrow in the diagram! You should have removed six flat-head Phillips screws and four round-head Phillips screws. Put the screws aside so you don't lose them.

After the screws are out, carefully lift the end labelled FRONT in the diagram up a few inches. It should hinge open. You will notice a DIP connector connecting the keyboard assembly to the main assembly. Using extreme care, gently unplug this connector from the main board and note its orientation (you'll be putting it back later!).

After you have disconnected the keyboard connector from the main board, you are ready to lift the bottom off completely. Set it down in a safe place (where no one is likely to step on it).

Next, to remove the keyboard from the case, simply remove the screws at each of the four corners of the board. If your Apple is a fairly recent one, you will notice that the keyboard has a "piggyback" board connected to it. Removal of this piggyback board is a bit tricky. Locate the two white plastic posts that extend through it. You will notice that these posts serve to hold the boards together by means of tiny plastic expanding tabs. With a needle-nose pliers, squeeze these tabs together to unlock the posts from the board. Carefully separate the boards, taking care to notice that a 25-pin connector must also be separated. To replace this board, first align all of those 25 fragile pins into the proper holes and then push the boards together firmly to lock the plastic posts.

That's all there is to disassembling an Apple. The procedure is fairly simple; about the only tricky thing is removing the piggyback board from the main keyboard. While you're inside your computer, you might want to give the insides a thorough cleaning. You'd be amazed at the amount of dust, dirt, hair, and assorted particles that find their way into a computer!

WHO'S WHO IN NEW-WAVE MUSIC

I received a post card from Wilbur T. Golson W4AV regarding my April column. He said: "Re: 'The End of Amateur Radio': I agree with your thoughts one hundred percent, but the majority of hams don't. I feel that the code test should have been dropped and the technical tests and rules beefed up to keep with today's modern technology. The FCC feels the same way, but it seems that the 'I had to learn it, so you should, too' attitude is far too common. I don't know who David Byrne is, but he may be right. . ."

The reference to David Byrne is regarding a quote I used in the April column: "Watch out, you might get what you're after." For those of you who *don't* watch MTV (and I certainly don't hold that against you), David Byrne is a new-wave musician whose group The Talking Heads sings that line in one of their songs. Next time I'll know only to quote well-known people.

While I'm on the subject of mail, I received a number of interesting ideas in a letter from Charles W. Creasy III (who neglected to give his callsign) concerning the need for a computer operating system designed for amateur radio. Features that such an operating system might incorporate are conversion from one code to another (ASCII, Murray, EBCDIC, AMTOR, etc.) and real-time control of amateur-radio hardware (transmitters, receivers, antenna rotors). One could program amateur-radio applications in the high-level language of his choice and perform any needed function with calls to the operating system. Such programs could be made machine-independent; the operating system, customized for a particular computer, would take care of hardware *differences.*

The concept of an amateur-radio operating system is an intriguing one. If anyone has implemented anything along these lines, I would like to hear about it. In the meantime, I think I'll look at the feasibility and practicality of such a system. I

can see the value of such an operating system for applications other than amateur radio. Many computer interface problems are due to a poor communications interface, and computer-to-computer communications over media other than ham radio is a rapidly growing field.

CONNECTING A COMPUTER TO THE OUTSIDE WORLD

In some of the mail I've received, I have noticed a common problem in interfacing a computer to another device. Much of the confusion is focused on the computer's end of the interface—most hams know how to interconnect ham equipment without too much difficulty.

Most home computers use TTL logic circuitry. These components work with two voltages: +5 volts (or a bit below it) and 0 volts (or slightly more). These two voltage levels are used to represent the zeroes and ones that a computer thrives on. As you probably know, computers represent numbers and symbols with binary numbers. A binary number is a number in base 2 and is written using only the symbols 0 and 1. As with the more familiar base-10 numbers, the value of a particular digit depends on its *place* within the number. For example 0101 would be the number five in binary; there is a one in the ones place and a one in the fours place, adding up to five.

What do binary numbers have to do with computer input and output (I/O)? Everything! Remember that the ones and zeroes are represented within the computer's hardware by the presence or absence of electrical current. By connecting special circuitry to look for specific patterns of current on a computer's internal data lines, devices can be controlled with computer commands. It is this principle that is the basis for all computer interfacing.

Let's look at how the built-in I/O ports on an Apple II computer work. The 6502 microprocessor in an Apple II has 16 "address lines" and 8 "data lines." These lines are simply connections on the microprocessor chip that are used to signal a particular memory address or 8-bit data item to the other components of the computer. By having different patterns of on and off voltages on these connections, different memory addresses and data items can be specified.

Usually, the address lines are decoded by the memory chips; when the circuitry associated with the memory chips sees a particular voltage pattern on the address lines, the data contained at the location specified by that pattern is fed into (or taken from) the 6502's data lines.

Memory chips are not the only components which can interpret the information contained on the address lines, however. It is possible to have other circuits recognize certain addresses. The designers of the Apple II computer used this principle to control the four output lines and three input lines on the computer's "Game I/O Connector." Circuitry inside the Apple looks for certain voltage patterns and uses the presence of certain ones to switch the four outputs on or off. For example, placing the binary pattern 1100000001011000 will turn output number 0 off; the pattern 1100000001011001 will turn it on.

You're probably thinking, "How am I going to get the 6502 to put that bit pattern on the address lines?" The answer is remarkably simple. Just have the computer execute any statement that references that address.

It so happens that the two binary bit patterns mentioned before correspond to the numbers 49240 and 49241 in the more familiar base-10 notation. So, if we execute the Basic statement Q = PEEK (49240), we can flip that output off. Similarly, the statement Q = PEEK(49241) will turn it on. Note that the value assigned to Q is meaningless. It is simply the *reference* to the memory location that does the work. Any variable can be substituted, and the result will be the same.

The off/on locations for the other three outputs are: 49242/49243 (output 1), 49244/49245 (output 2), and 49246/49247 (output 3). Outputs 0 through 3 correspond to pins 12 through 15 on the game port connector.

The Apple also has three inputs that work in a similar manner. By using the Basic PEEK command for locations 49249 through 49251, a value can be obtained to indicate if the input is "high" or "low" (0 or 1). For example, the command Q = PEEK(49251) will assign Q a value less than 128 if the input is high and a value greater than or equal to 128 if the input is low.

Caution: These input and output lines are designed to handle the special voltage and current levels used by the computer chips. Do not attempt to connect any device to these I/O lines without the appropriate interfacing hardware.

Next time, I'll describe how to properly interconnect computer I/O ports with other devices. I'll also cover Atari and TRS-80 computer I/O ports.

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

RADIO AND ELECTRONICS PIONEERS

It is natural that one should wonder whether the wireless telephone is destined to displace our present apparatus [telegraphy]. This does not seem at all probable. In the first place, wireless telephony is now, and probably always will be, very expensive. Wherever the wire will do, it is the more economical... Millions of messages going in all directions, crossing and recrossing one another, as is done every day by wire, are probably an impossibility by radio telephony. Weird and little-understood conditions of the ether, static electricity, radio disturbances, make wireless work uncertain, and such a thing as twenty-four-hour service, seven days in the week, can probably never be guaranteed.—Walter Kellogg Towers, *Masters of Space*, 1917.

Don't you just love the predictions of so-called experts? Every time I read a newspaper article or see a television report predicting the future of the electronics industry, I think of the preceding quote.

Fortunately, the subjects of this month's column—radio and electronics pioneers—didn't hold the same beliefs as Mr. Towers. These were men who were willing to take chances on a dream. They didn't care if their goals meshed with the expectations of society. If they did, our shacks would probably consist of little more than paper cups and strings. (I've got a Dixie HW-101, how about you?)

So let's learn a little bit about the people who made our hobby what it is today. And let's all remember how they bucked the advice of the experts. Ham radio could use a little more of that attitude today.

ELEMENT 1 MULTIPLE CHOICE

1) Which of the following devices was an invention of Sir Hiram Stevens Maxim, father of ARRL founder Hiram Percy Maxim W1AW?
 1) Radioscope
 2) Self-regulating generator
 3) Carbon resistor
 4) All of the above

2) Which of the following men first proposed naming the two electrical poles "plus" and "minus"?
 1) Thomas Edison
 2) Henry J. Faxton
 3) Michael Faraday
 4) Benjamin Franklin

3) English philosopher and chemist Joseph Priestly:
 1) Proposed the inverse square law
 2) Invented the galvanic jar
 3) Discovered the unit of quantity
 4) Developed the practical nicad cell

4) German physicist Thomas Johann Seebeck discovered the "Seebeck Effect," which eventually became known as:
 1) Radiation
 2) Thermal electromotive force
 3) Electricity
 4) Static discharge

5) Samuel Morse constructed his first telegraph from:
 1) Aluminum
 2) An old picture frame
 3) Bits and pieces of old newspapers
 4) Scrap iron

6) Name the two actors who portrayed Thomas Edison in MGM movies during the 1930s.
 1) Spencer Tracy, Don Ameche
 2) Raymond Massey, Cedric Hardwicke
 3) Mickey Rooney, Spencer Tracy
 4) William Powell, Humphrey Bogart

ELEMENT 2 MATCHING

Match the names in column A with the inventions in column B.

A	B
1) deForest	A) Radar
2) Fleming	B) Television
3) Fessenden	C) Teleprinter
4) Baekeland	D) Radiotelephony
5) Hilliard	E) Triode
6) Affel/ Epensched	F) Diode
	G) FM radio
7) Stanley	H) Magnetic detector
8) Shockley/ Brittain/Bardeen	I) Transistor
	J) Bakelite
9) Armstrong	K) Heterodyne
10) Taylor/Young	L) Radio beacon
11) Berliner receiver	M) Tape recorder
	N) Photoelectric cell
12) Elster	O) Circuit breaker
13) Poulsen/ Fessenden	P) Multigrid tube
	Q) Ac transistor
14) Marconi	R) Static power
15) Zworkin	S) Coaxial cable
16) Alexanderson	T) Cascade tuning
17) Poulsen	U) Microphone
18) Morkrum/ Kleinschmidt	
19) Donovan	
20) Langmuir	

ELEMENT 3 TRUE-FALSE

	True	False
1) Zenith, the famous electronics company, derives its name from an amateur call.	____	____
2) The callsigns of the first two FM broadcast stations were KE2XCC and W2XMN.	____	____
3) David Sarnoff, founder of RCA, first rose to national attention by relaying distress messages from the ill-fated RMS Lusitania.	____	____
4) The first US broadcast radio station was WPLJ in Albany, New York.	____	____
5) During World War I, the US Navy's primary school for wireless operators was located at Harvard University.	____	____
6) At the time he discovered radio, Marconi was only 29 years old.	____	____
7) Lee deForest went bankrupt at the age of 33.	____	____
8) Reginald Fessenden was an adopted son of Thomas Edison.	____	____
9) Michael Faraday, of unit of capacitance fame (the farad), died in 1967.	____	____
10) The coulomb—the unit of electrical quantity—is named after Charles Augustin Coulomb (1736-1806).	____	____

ELEMENT 4 SCRAMBLED WORDS

Unscramble these names of radio and electronics pioneers.

RAMINCO	YARAFAD	LAVOT
RETZH	HOM	ROSEM
PRAMEE	YARAFAD	SLATE

THE ANSWERS

Element 1:
1—2, 2—4, 3—1, 4—2, 5—2, 6—3.

Element 2:
1—E, 2—F, 3—K, 4—J, 5—O, 6—S, 7—Q, 8—I, 9—G, 10—A, 11—U, 12—N, 13—D, 14—H, 15—B, 16—T, 17—M, 18—C, 19—L, 20—P.

Element 3:
1—True From the call of the company's founder, E. F. McDonald 9ZN (originally ZN-ith Radio Products).
2—True The experimental stations run by Armstrong in New York and New Jersey.

3—False It was the Titanic.
4—False KDKA in Pittsburgh, Pennsylvania.
5—True Harvard was a major training center for the War Department during the Great War.
6—False He was only 22!
7—True But he made up for it later.
8—False Hardly. He was the son of a Canadian minister.
9—False 1867.
10—True The one and only.

Element 4:
(Reading from left to right) MARCONI, EDISON, VOLTA; HERTZ, OHM, MORSE; AMPERE, FARADAY, TESLA.

SCORING

Element 1:
Four points for each correct answer.
Element 2:
Two points for each match.
Element 3:
Two and one-half points for each correct answer.
Element 4:
Two points for each name unscrambled.

1-20 points—Still in the Dark Ages
21-40 points—Communicator
41-60 points—Radio cadet
61-80 points—Academician
81 + points—Son of the pioneers

HAM HELP

I need a schematic and any technical information on an SBE SB-144 two-meter crystal-controlled transceiver. I will pay any and all copying and postage costs.

Dick Roux N1AED
25 Greenfield Drive
Merrimack NH 03054

Help! I now own a working NC-109 general-coverage receiver. I need information about it so that when it no longer works, I can find out why. (Also, I may want to perform modifications to it.)

Also, I have been having a terrible time trying to connect a Western Electric #1035C3A-type touchtone™ pad to a 500-type telephone set. Any help at all will be greatly appreciated.

Thanks a lot.

Andrew W. Gaunt
52½ Washington Street
Newburyport MA 01950

Help! I am a Novice and I need the manual (or a copy) for the Heath model HW-16 and any modification for HW-16, and also the manual (or a copy) for the Heath VFO-1. I will gladly pay postage and copying costs.

Edward Molser KA2IVD
4376 Coolidge Rd.
Coleman MI 48618

I need an operating or technical manual for a Nems-Clarke Spectrum Display Unit, model 200-3. The unit is a narrow-bandwidth spectrum analyzer, apparently used by the military to monitor the 30-MHz i-f output of UHF or microwave converters. I will pay reasonable copying costs.

My thanks to you for your service. I have utilized "Ham Help" once before and got many offers of help, including long-distance phone calls. Since then, I have helped several others using your service.

Bob Lombardi WB4EHS
2046B Ranee Place
Melbourne FL 32935

I have been a subscriber to *73* for over twenty years. I now have a problem which you might be able to help me with. I am looking to locate a published article or other information concerning the effect of radio frequency transmissions on an implanted heart pacemaker.

Your help will be greatly appreciated.

Maurice J. Hindin W6EUV
10471 La Conte Avenue
Los Angeles CA 90024

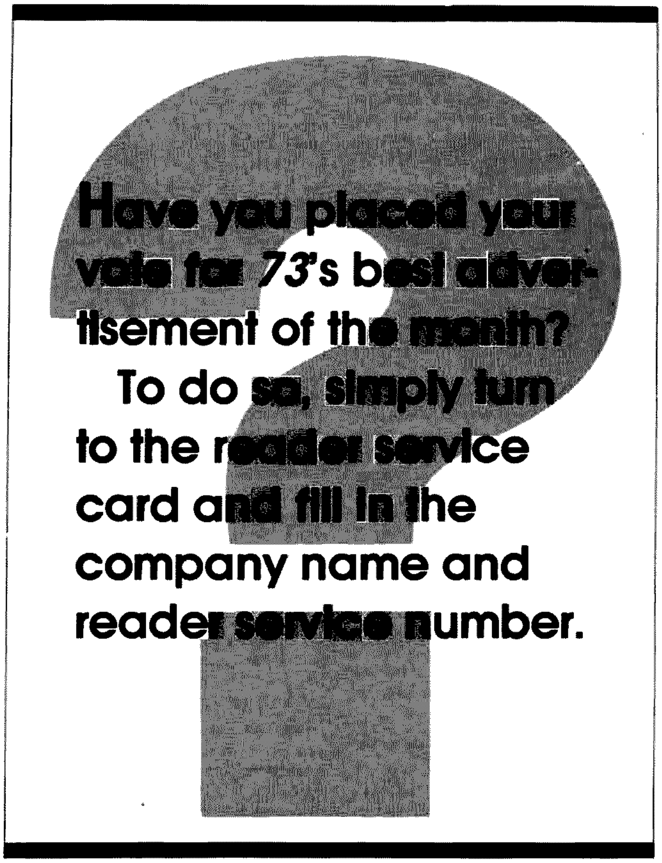
SATELLITES

RS-5 UTC	RS-5 EQX	RS-6 UTC	RS-6 EQX	RS-7 UTC	RS-7 EQX	RS-8 UTC	RS-8 EQX	Date
0142	172	0006	154	0028	155	0044	153	1
0136	172	0150	182	0019	154	0041	154	2
0131	172	0134	179	0009	153	0038	155	3
0126	173	0119	177	0158	182	0036	156	4
0120	173	0103	175	0149	181	0033	156	5
0115	173	0048	172	0139	180	0030	157	6
0110	173	0033	170	0129	179	0027	158	7
0104	173	0017	168	0120	178	0024	159	8
0059	174	0002	166	0110	177	0021	160	9
0053	174	0145	193	0100	177	0019	160	10
0048	174	0130	191	0051	176	0016	161	11
0043	174	0114	188	0041	175	0013	162	12
0037	174	0059	186	0032	174	0010	163	13
0032	175	0044	184	0022	173	0007	164	14
0027	175	0028	181	0012	172	0004	164	15
0021	175	0013	179	0003	171	0002	165	16
0016	175	0156	206	0152	200	0159	196	17
0011	175	0141	204	0142	199	0156	197	18
0005	175	0125	202	0133	198	0153	198	19
0000	176	0110	199	0123	198	0150	199	20
0154	206	0054	197	0113	197	0147	199	21
0149	206	0039	195	0104	196	0144	200	22
0144	206	0024	192	0054	195	0142	201	23
0138	206	0008	190	0044	194	0139	202	24
0133	207	0151	218	0035	193	0136	203	25
0128	207	0136	215	0025	192	0133	204	26
0122	207	0121	213	0016	191	0130	204	27
0117	207	0105	211	0006	190	0127	205	28
0112	207	0050	208	0155	220	0125	206	29
0106	208	0034	206	0146	219	0122	207	30
0101	208	0019	204	0136	218	0119	208	31
0056	208	0004	201	0126	217	0116	208	1
0050	208	0147	229	0117	216	0113	209	2
0045	208	0131	226	0107	215	0110	210	3
0039	209	0116	224	0057	214	0108	211	4
0034	209	0101	222	0048	213	0105	212	5
0029	209	0045	219	0038	212	0102	213	6
0023	209	0030	217	0028	212	0059	213	7
0018	209	0014	215	0019	211	0056	214	8
0013	209	0158	242	0009	210	0053	215	9
0007	210	0142	240	0000	209	0051	216	10
0002	210	0127	238	0149	238	0048	217	11
0156	240	0112	235	0139	237	0045	217	12

CORRECTIONS

The address for the SW station in Norway, page 49, *73* for April, 1984, should be: Radio Norway, Oslo 3, Norway.

Roger N. Peterson
New Canaan CT



73 INTERNATIONAL

from page 62

to be noted is that under the strong pressure and reaction of the amateurs, the Post and Telecommunications Ministry (MPT), has warmly invited the ARI directors for a friendly exchange of opinions for the first time in Italian radio-amateur history; opening its golden doors to hams, it has made a descent from its throne, receiving their representatives and discussing their problems in the presence of the Minister of Posts, Senator Gava, and the MPT general manager, Dr. Monaco.

Together with beautiful words on the importance of the amateur-radio service, on its social values, etc., words which were absolutely unheard before, as a first step the MPT released the 160-meter band, the 18- and 24-MHz bands, and promised the 10-MHz band (with some frequency limitations) in a very short time. Moreover, the MPT promised to authorize in very short time the 144-and-up repeater network, the free transfers of stations, and mobile operation.

The more controversial matter appears to be the 3.5-MHz band, as the MPT proposes for amateur use only a segment of 100 kHz. A very important and perhaps decisive meeting between the ARI and the MPT will take place soon. I hope to be able to announce a complete amateur victory in the next column.

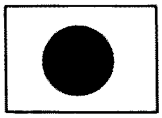
The most important observation which should be made on this "Italian Affair" is that in a free and democratic country, the radio amateur's community, even if small, like any other citizen's community, can safeguard its own rights while fighting against forces which, at first, could be judged not suitable to be attacked, like powerful government agencies—telecommunications, military, etc.

The Italian amateurs, who had been judged weak and inoffensive by the administration (and just for that reason were kept for decades in a substandard position), suddenly raised a fierce and strong protest when the 3.5-MHz band was practically closed. The battle started from this point and was extended to the other controversial areas like repeaters, mobile operations, and so on.

Open discussions on these matters were kept on the air, a very sharp protest against the MPT, and the ARI, whose action was judged weak and ineffective, then started writing in the technical magazines. Groups of amateurs, and I was among them, started to organize actions through radio, TV, newspapers, and weekly magazines. A petition with thousands of cards, telegrams, and letters was directed to the President of the Republic, Sandro Pertini. The echo of this big noise filtered through the MPT walls, and the MPT, surely fearing negative public opinion, suddenly changed its own behavior in such a way that it was the first to contact the amateurs in order to modify the clamor they were raising.

At present, we are strongly believing that almost all our targets will be hit.

I think that the "Italian Affair" will make history, and also I believe it should be studied deeply wherever similar problems arise in other countries.



JAPAN

Roy E. Waite W9PQN
Tomigaya Grand-301, 2-19-5 Tomigaya
Shibuya-Ku
Tokyo 151
Japan

AN INTERVIEW WITH SHOZO HARA JA1AN

(JA1AN is President of JARL—the Japan Amateur Radio League, Inc.)

Waite: How many members does the JARL have at present?

Hara: We have 131,000 members. And here in Japan at present there are 565,000 amateur stations.

Q: I know that Japan is now number one in the world in the number of amateur-radio operators. Are the members of the JARL increasing year by year? What is the trend?

A: Yes, there is a gradual increase.

Q: Is it a large increase? About what is the percentage of the yearly increase in membership?

A: Until now the yearly increase has been tremendous, but these days the increase in membership has been slowing down.

Q: Throughout the years, the JARL has accomplished many, many things. Could you just tell us about a few of the more important accomplishments? For instance, I know that the JARL succeeded in getting a "window" at 3.803. That was due to the JARL efforts, wasn't it? What do you think were the most important accomplishments?

A: Let's talk about frequencies. In 1952, when amateur radio was again reopened after the war, the JARL succeeded in getting permission to operate on 14, 21, 28, 50, and 144 MHz. On 40 meters we were given only two channels, which were 7,050 and 7,087.5. Then in December of 1956, 40 meters became a real band and we could then operate from 7.0 through 7.1.

Q: Were you the JARL president during that period?

A: No. At that time I was a director.

Q: I see.

A: In 1955 we got 3.5 MHz. In 1956 we got 435 MHz and 1.8 MHz. Year by year, the JARL succeeded in obtaining more frequencies. About ten years ago we obtained the "window" at 3.803 which you mentioned earlier.

Q: So all of these came step by step.

A: Yes. After that we got 1200 MHz. And then 5 GHz, 2 GHz, and others. All of these came gradually.

Q: Now, moving to more recent accomplishments, one of the things that comes to mind is repeater operation.

A: Yes, we finally got government permission in 1982, and repeaters first appeared last year, 1983. We had been working on that for 20 years!

Q: Why was it so difficult to get government approval for repeaters?

A: In Japan, domestic communications are controlled by NTT and international communications by KDD. No one other than those two entities was allowed to operate repeaters. But we succeeded in having the interpretation of the rules relaxed somewhat in order to accommodate amateur-radio operation of repeaters.

Q: How many times did you visit the Ministry of Posts and Telecommunications (MPT) before you finally succeeded?

A: On the average, I visited the MPT once a week. At the present time, there are 150 repeaters on the air in Japan. And there are 290 repeater applications on file which will be acted upon. So sometime this year there will be more than 3000 repeaters in operation here.

Q: There is a jamming problem on the repeaters, at least here in Tokyo.

A: Yes. Well, especially your club, TIARA, has problems because your repeater is located on top of Hotel Okura, one of the highest points in Tokyo. The question is, what are we going to do about all the trouble that we have been having with this repeater? I have talked to the MPT about this. What we are thinking is to add some repeaters around the hotel to cover almost the same area, so that the number of users on each repeater would be somewhat diluted. The TIARA repeater gets out so far and so well that it attracts a lot of users.

Q: We get the impression that because we are speaking English on this repeater, we are deliberately jammed. I can't imagine the same situation in America, although I have heard there are some jamming problems there, too.

A: Well, it's true that the TIARA repeater is having more trouble than other repeaters. And while it is true that English-speaking hams on that repeater do attract some troublemakers, it is not the main reason for the trouble. The main reason is that it is right smack in the middle of Tokyo, probably the world's most populous city, hamwise, at least. And it is at the highest point in Tokyo, so it covers a very wide area. We think that if a lot more repeaters go on the air in this area, most of the troubles will disappear.

Q: Did you hear about the incident the other night where employees of Hotel Okura actually apprehended a taxicab driver near the hotel who was jamming the repeater?

A: Yes, I heard about that. We know about that and other incidents, as well. We inform the MPT about all of these problems.

Q: Let's talk about the progress in the reciprocal license field.

A: We really thought we could accomplish a reciprocal agreement with the US in early 1982, but here it is 1984 and we haven't succeeded yet. The plan is to begin by having the first Japanese reciprocal agreement with America. Somehow or other we haven't been able to settle certain matters. So we don't have anything yet.

Q: I have heard that the ball is on the US side now. Is that right?

A: Well, actually the problem is here in Japan. In this country, we have a separate station license, separate operator's license, station inspection, and complicated application procedures. In America, you don't have to contend with all of those things. In Japan, to go on the air, there is a mountain of bureaucratic red tape to get through. In America, it's relatively simple, as it is in Germany, too. This is a very difficult problem to overcome.

Q: Do you think it is arrogant of the US to insist on Japan changing its rules to match the American side?

A: No, I don't. Reciprocal means "same." Same rules and procedures. So we're trying to come up with a way to simplify the procedures. The law was changed in the Japanese parliament in 1981, so the stage has been set. The problem now is how to apply the law and to work out details of applying for permission and regulations and restrictions that will apply.

Q: So when do you think we can expect to see a reciprocal agreement with America?

A: I had been hoping for March of this year, but some people are saying it won't come until June or July.

Q: Now on to other items. In 1958, the licensing structure was changed dramatically in Japan with the introduction of a no-code class. This was an accomplishment of the JARL, wasn't it?

A: In 1982, when ham radio was again allowed in Japan after the war, we had only first- and second-class stations, with power limited to 500 and 100 Watts respectively. So the JARL came up with a plan, in 1957, to add two new classes, with power limited to 10 Watts. One was a phone, no-code license, and the other was a CW-only license. This was approved by the government in 1958.

Q: Did you play a part in this, Mr. Hara?

A: Yes, I was the main force behind that.

Q: When did you become president of the JARL?

A: Well, I was already involved with the JARL in 1941, and in 1948 I was working at the head office, although it is misleading to say "working," as I didn't receive any pay. At that time we were working on getting permission to have ham radio restored in Japan. I became a director in 1952, vice-president in 1964, and president in 1970.

Q: So you have been president now for 14 years. Is it a satisfying job being president of the JARL?

A: Yes, I enjoy it very much, although it keeps me very busy.

Q: I know you are already very busy at Mitsubishi Heavy Industries in your regular occupation. What is your job there?

A: My title is Chief Engineer, Shipbuilding and Steel Structures Headquarters.

Q: So I would imagine that this job keeps you very busy.

A: Yes.

Q: How do you find time for the JARL activities?

A: It seems that I am on the go from morning until late at night. As for the company, if there is nothing special going on, I work from 8:00 am in the morning until 10:00 pm at night. During those hours I squeeze in JARL affairs. The company is closed on Saturday, but if there is nothing for me to attend to at the JARL, I go to the Mitsubishi Heavy Industries office

Q: Do you go to the JARL office every day?

A: No, I don't, but I am in frequent contact with the JARL officials as necessary.

Q: Is it true that most of the directors are retired MPT employees? I heard a rumor about that some time ago.

A: No. Not true. There are 20 directors, but not even one is from the MPT. Among those 20 directors we have one president, two vice-presidents, a general secretary, and 16 other directors, 10 of whom reside in the outlying call areas. The other six reside in Tokyo. Also there is one auditor.

Q: Do the directors receive a salary?

A: No. Nothing.

Q: Are you, Mr. Hara, paid for your services?

A: No. Nothing at all. In fact, I sometimes have to spend some of my own money. Even when the JARL holds a party, I have to pay the admission fee like everyone else. The directors are volunteers and don't receive a salary. But we have 140 employees in the headquarters here in Tokyo who are paid a salary.

Q: Are there any salaried employees in outlying areas?

A: In the JA2 area there are three; in the 3 area there are eight; in the 4 area there are

two; in the 5 area there are two; in the 6 area there are three; and so forth. Those people receive a salary from the JARL. Total for the year is about 400,000,000 yen.

Q: One of the recent accomplishments has been in the area of amateur examinations given in this country. It used to be that Japanese could take the exam only twice a year. But the JARL succeeded in expanding the exam schedule. Did you play a part in that, Mr. Hara?

A: Yes, I did. I suggested to the Ministry that they give the examinations every day instead of twice a year. But they said money was the problem. Thereafter, a separate entity was established called the "Examination Center" to which the JARL contributed 100,000,000 yen. This was established in Tokyo only, but soon there will be examination centers like that throughout the country.

Q: On a different subject, I have heard Japanese as well as foreign hams state that one of the problems here is the large number of Novice phone-class hams and their bad behavior at times. What do you think about that?

A: I don't agree with that at all. It depends on the individual, not merely on the class of license they happen to hold.

Q: Mr. Hara, when did you first become interested in ham radio?

A: I first became interested in ham radio in 1938 and I became a ham in 1952, with my present callsign, JA1AN.

Q: May I ask how old you are?

A: I am 57; I was born on September 26, 1926.

Q: What bands are you active on, Mr. Hara?

A: Well, I'm too busy to be very active on the air, but when time permits, I like to get on 6 and 2 and 430 MHz.

Q: Are there any other hams in your family, Mr. Hara?

A: There certainly are. My wife, Yoshiko, is JA1ECQ, my daughter, Hisako, who is married and has a child, is JG1QIK, and my son Keizo is JG1WTK.

Q: Do you have any hobbies besides ham radio?

A: Yes, I am an equestrian. I like to ride horses and I belong to a riding club, and I ride whenever I can find the time.

Q: On behalf of 73 magazine, I'd like to thank you for taking the time from your busy schedule to talk with us today.

A: Thank you. It was my pleasure.

LIBERIA

Brother Donard Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
PO Box 1005
Monrovia
Liberia

AMATEUR RADIO IN LIBERIA

It is not difficult for an American to obtain an amateur-radio license in Liberia. If he holds an American license that is current, he simply presents it at the Ministry of Post and Telecommunications and receives the equivalent Liberian license. Under normal circumstances this can happen within twenty-four hours. If he does not hold a current American license, he will receive his Liberian license upon having passed examinations in international Morse code and in amateur-radio theory. The theory examination consists of basic electronics, national and international regulations concerning amateur radio, and common amateur practice. In general, these tests are very similar to those given in the States.

Regulations and procedures for obtaining amateur licenses differ from one country to another, and it is not surprising that some countries restrict the privilege of operating amateur radio to their own citizens. An expatriate simply cannot obtain a license at all. It is necessary, therefore, for any given country to investigate the requirements of that country.

The office of the Ministry of Post and Telecommunications of Liberia is located in the post office building in Monrovia. It is open every working day and there is always someone there to give service or direction.

If the person who is seeking an amateur-radio license is in need of instruction, he may go to the Ministry and make known his needs. They will direct him to a place where instruction is available, and it is free. There are two organized classes in amateur radio in Monrovia each year, and individual instruction is available for anyone who is not able to attend one of the classes. Like courses are being organized in some of the other cities.

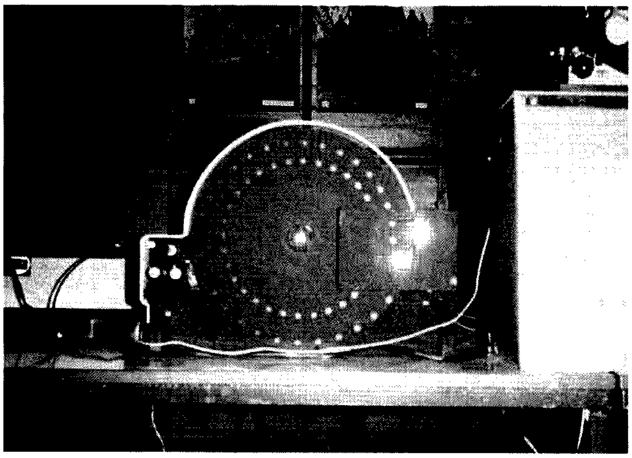
In Liberia, the amateur-radio association has been entrusted with the task of instructing and testing applicants for an amateur license. The president and his officers are very generous with their time and will schedule an examination for *one person* if the need arises! Whatever the case may be, when an applicant has passed the examinations, the exam papers with the grade are sent to the Ministry along with a letter recommending that the applicant be given his license and call letters, and this is usually done within a day.

In this country, there are only two classes, the Novice and the General. The Novice class has privileges similar to the Novice class in the States—with one notable exception. Here, the Novice may operate phone at 7.060 MHz; this is the frequency used by the West African Net and so allows the Novice to take part in the net activities. In Liberia, this becomes very important because the net is a vehicle for passing messages from one part of the country to another.

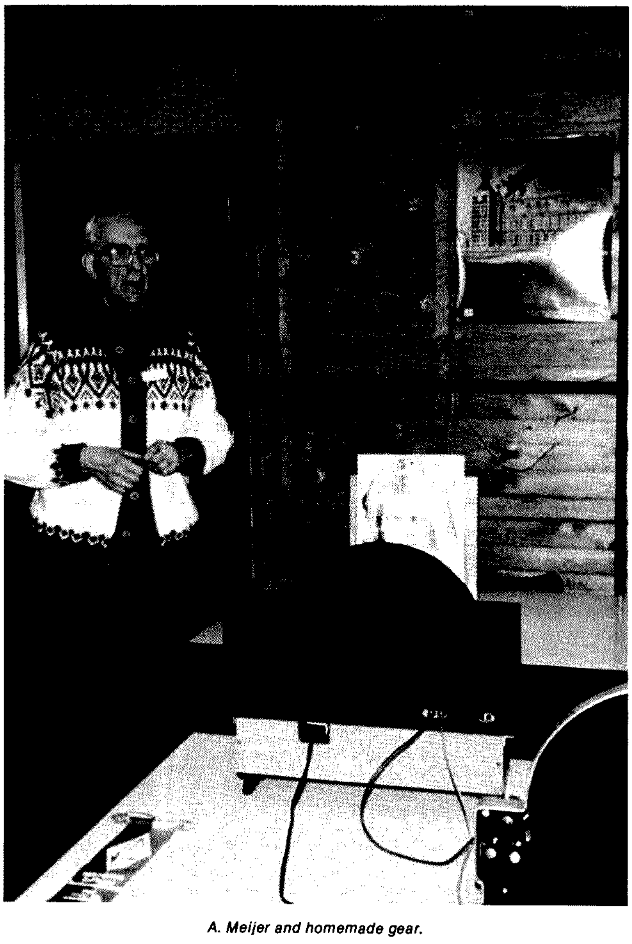
The General class has all the privileges which are allowed to amateur radio in Region I. There is no higher amateur license in Liberia. It is a fact, however, that when a Liberian General license is presented for the equivalent American license under the reciprocal agreement between the two countries, it is the American General license that is awarded, not the Extra.

There are many Americans who come to Liberia and establish residence for two or three years—or for much longer. The greatest number of these are missionaries, but there are also Peace Corps volunteers and businessmen as well as members of the diplomatic service. Many of these people look to amateur radio as a means of keeping in touch with home. This article should be a real help to them. On a much broader spectrum, chances are that American amateurs will enjoy just knowing how it is done in another country.

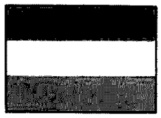
Should anyone wish further information, please feel free to write to me personally at the address given above.



Nipkov disk in action.



A. Meijer and homemade gear.



THE NETHERLANDS

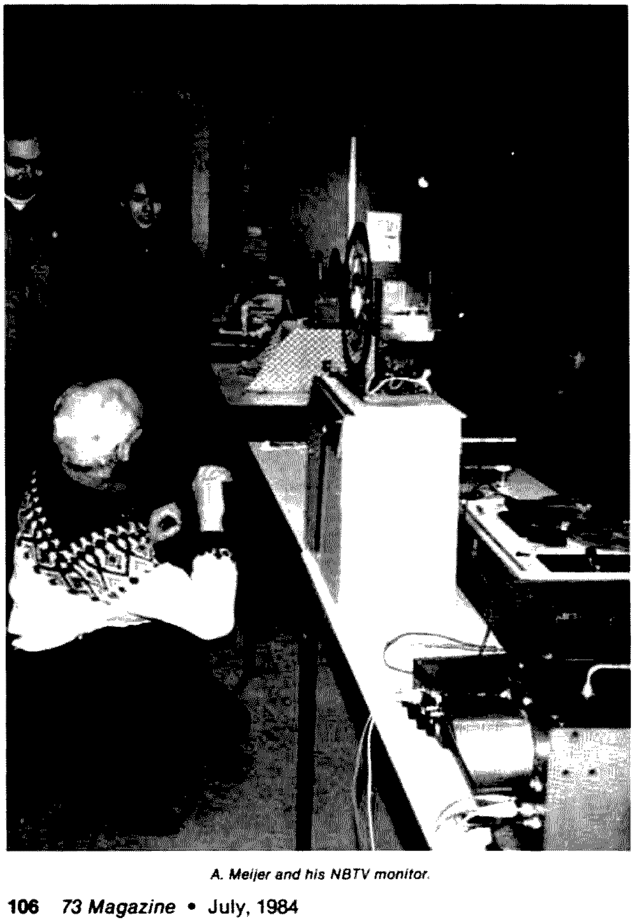
Henk Meerman PD0DDV
Zandvoorterweg 33
2111 GR Aerdenhout
The Netherlands

In the December, 1983, issue of this magazine, I told you about the NBTVA (the Narrow Bandwidth Television Association), a club with only a handful of enthusiastic members with two things in common: ham radio (most of the NBTVA members are hams) and a desire to construct mechanical television equipment.

The parts that they use are Nipkov disks, mirror drums, motors, etc. As a member of this association, I made a recent visit to the meeting that they hold once a year. This year the meeting was held in the southern part of my country, in the city of Eindhoven. I'll give you a full report of what there was to see.

On the 18th of March, some fellow hams and my YL and myself, of course, drove by car to Eindhoven. Because it was on an early Sunday morning when we started, it was very quiet on the roads and that's why we had a safe journey to Eindhoven and the club where the meeting was. All we had was the address, but, as promised, a friendly operator was listening for any visitors, and when we gave a shout on 145.15 MHz, we got an immediate response from PA0PWA, who talked us to the right spot.

A. Meijer and his Nipkov disk.



A. Meijer and his NBTV monitor.

When we entered the building, we got a warm welcome from Mr. A. Meijer, the president of NBTVA, and his wife. He had brought some nice gear: a camera and separate monitor, both with Nipkov disks, all homemade and all in working condition. Most members use Nipkov disks made by Mart Schouten PA0MJS.

Mart, who in daily life is a mechanical designer, makes the Nipkov disk with an almost unbelievable accuracy. He uses aluminium for less weight. Since it is a hell of a task to make a good Nipkov disk, most of the members knock on Mart's door to buy one from him.

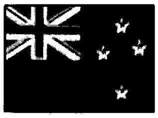
Mart brought a single monitor (television) with an antique-style wooden cabinet and a combined camera/monitor which was a real piece of craftsmanship. We also had a chance to see a part of the original equipment as used in the early days of TV by PA0DXY. PA0DXY made broadcasts with narrowband TV in 1935 and 1936. Before we went home, I got good advice from Mart about how to improve my equipment, and I bought one of his new-design disks.

THE EVOLUON

Being in Eindhoven, we took the opportunity to visit the Evoluon. Evoluon is the name of a building where a permanent exhibition is held about science, communications, computers, energy, and mathematics. When you visit Holland, it is a must to see it. It gives you a good example of the state of the Dutch electronics industry today, and it is presented in a popular way so that even minors can enjoy it.

The Evoluon is owned by Philips Company, the well-known manufacturer of electronic equipment in Holland. It has its own amateur-radio station with the callsign PE2VO; it is active on most of the ham bands.

After this visit we drove home, arriving at 6:00 pm. We looked back on a very interesting and nice day, although we were all a little bit tired because we had an early start.



NEW ZEALAND

Des Chapman ZL2VR
439 Kennedy Road
Napier
New Zealand

SIX METERS DEAD! SUNSPOT CYCLE 21 GONE!

That's what everyone was saying, but after the ZL summer "silly" season, six meters is far from from dead, even if sunspot cycle 21 has gone. From Kerry ZL2TPY, New Plymouth, this report on some of the six-meter activity over the period mid-December to the end of February shows that 6 was very active in this area.

Within that period, Kerry worked about 720 QSOs with just over 200 different stations in 29 countries, which included VKs 1 through 6, 8, and 9, JAs 0 through 7, FK8, FK0, H44, 3D2, YJ8, ZL8, ZL4/C, and all ZL Districts. All the contacts were worked using 10 Watts USB into a home-brew 5-element yagi, 50 feet up on a hill, one mile from the sea at New Plymouth.

New Plymouth, on the west coast of ZL's North Island, appears to be the "Hawaii of the South" for ZL-VK contacts. (It must be the iron sands or Mt. Egmont attracting the signals.) Many VKs commented that ZL2TPY was the first and last signal heard each day on 6 meters from ZL and one of the strongest stations heard in many years. The same location appears to be favorable also for 2 meters and 70 cm with over 50 VK2 and VK4 2-meter SSB simplex contacts notched so far.

As this sunspot cycle 21 dies away, sporadic-E and F_2 were thought to increase, which seems to be borne out by this year's summer activities, and ZL1MQ, one of our long-standing 6-meter enthusiasts, says it's the most intense sporadic-E summer he's known in 30 years of 6-meter work.

Some of the highlights of Kerry's summer activities included working back-scatter propagation on several occasions with VK and ZL stations; the QRM and pileups on 51.1 MHz with JA were just about unbelievable—about 20 times worse than a DX Field Day contest on HF. Of the back-scatter contacts, Kerry worked VK2DFW, both beaming 260°, 5/7-5/9 signals for about 10 minutes, no signals at all beaming direct, and on a couple of occasions made contacts west to east coasts of the North Island lasting about 45 minutes, all stations beaming 30°, again with no direct-path signals whatsoever. On another occasion, back-scatter was found in all directions for more than two hours, and Kerry was able to work ZL1BXH, Kaitaia, about 400 miles to the north in a direct line, both stations beaming north for a QSO which lasted about 20 minutes.

As Kerry says, "A most exciting and unpredictable band, 6 meters, and it's not dead yet."

Another possible first during all this 6-meter activity was the ZL/VK YL-to-YL QSO when Mary VK4PZ, Rockhampton, Queensland, worked Carol ZL2VQ at Kerry's QTH in New Plymouth. Another 6-meter report from Bill ZL2CD, a long-time 6-meter man, confirms Kerry's information. Bill says the summer's sporadic-E season was one of his best for many years, with the appearance of some rare DX stations. The large number and the intensity of the openings made the band more like 20 than 6 at times.

In all, during December, Bill worked numerous VKs on 24 of the 31 days in the month, as well as the following DX stations: VK0 (McQuarrie Island), VK9 (Norfolk Island), ZL4/C (Chatham Islands), FK8, P29, I44, JA, and FO8. The most common VK beacon that Bill ZL2CD in Wellington could copy almost every day in December was VK2RSY, 52.42 MHz, as well as the VK television sound on 51.74, 51.75, and 51.76 MHz.

And still with the very high frequencies, another old ZL record was broken on January 15, 1984, when the 19-year old 144-MHz overseas record changed hands. ZL3AFN, Westport, South Island, made contact with H44SR, Malaita, Solomon Islands, a distance of 3769 km (2341 miles), but before the record can be ratified, confirmation has to be received of the QSO.

BITS 'N' PIECES

By the time this column goes to press, the successful Kermadec DXpedition will be an historical event. They are there at the time of this writing and have ZLs 1AMO/8AMO (Ron), 1BQD/8BQD (Rolly), 1AAS/8AAS (John), and ZL0AJW/8, otherwise known as W6REC (Deane Ausherman, who was invited to take VK9NS's place) in the DX team. From the sounds on the bands, they are being made to work hard and long, but then that's what DXpeditions are all about when the country is so sought after by amateurs all over the world. I did hear that one member of the team fell asleep during a personal QSO with home, and as you can imagine, that didn't do down too well with the XYL. But all was rectified with a phone call the next day when he was refreshed and awake.

But, remember, if you failed to work this group, don't forget Warwick ZL8AFH is resident on Raoul as a member of the Met station team located there, and, work load permitting, he will be operating as often as he can for several months yet. We all hope his rig troubles reported in the Australian column in the April *73* have been resolved.

The Kermadec Islands are situated about 600 miles northeast of ZL, and apart from the Meterological Station, are an uninhabited Nature Flora and Fauna Reserve area administered by the New Zealand Lands and Survey Department. The largest northern-most island, Raoul Island, the location of the Met Station, is also known as Sunday Island (7260 acres of volcanic origin with a large crater occupying much of its area). Though the highest point is only 1760', its surface is broken by deep ravines and rocky spurs that end at the sea as steep cliffs, which make landing a very difficult operation. The Met Station is serviced once each year by boat for main stores, etc., but there are periodic servicings of the station with mail and consumable stores by air drop from an Air Force Transport plane.

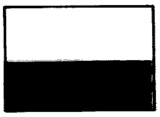
The DXpedition group travelled to the Kermadec Islands aboard the 15.5-meter yacht, *Shiner*, captained by an Englishman, John Taylor. Besides the amateurs, there were five scientists from Auckland University on board led by Dr. John Craig, who intended to carry out scientific studies on Raoul Island. Landing at Raoul Island is always extremely difficult because there is no safe beach area, shelter, or anchorage, but only rocky steep cliffs right to the water's edge and difficult sea swells most of the time. It is possible to land only in good weather conditions. After unloading is completed, the crew of the boat must stay aboard at all times in order to move the boat out should the weather deteriorate.

A few days after the party had arrived and established itself on Roaul, the weather caused the yacht's captain to move from the area near the Met Station around to the southwestern coast of the island to Boat Cove to shelter. However, the wind and seas increased and forced the *Shiner* onto the rocks at Boat Cove. The crew was able to land safely, but the *Shiner*'s ferro-concrete hull was badly holed and the yacht is now a write-off.

Plans have now to be made to evacuate the yacht's crew, the team of scientists, and the amateur DXpedition from the island when a suitable vessel is available to be diverted to Raoul Island to effect the rescue operation.

Over the years there have been amateur operators serving with the Met Station team, but the first occasion that Raoul Island was put on the air was in 1947 when Lew Sharman ZL2IC of Napier, then ZL1TZ, the Post Office radio operator with the station team, fired up the station CW transmitter on 80 and 40 meters. Later, after pondering how to get on phone with a CW-only transmitter, Lew found a way to use the modulator of the long-wave phone transmitter sitting next to the HF CW rig he was using to allow him to operate 80 phone as well. The method used (not recommended normally, of course) was to couple the HT from the CW transmitter to the modulator of the LW transmitter via a twin power cable and a wafer switch and so modulate the CW transmitter with the LW rig's modulator. Lew had many enjoyable QSOs from April to the end of the year when his tour of duty on Raoul Island ended. He was followed by another amateur in the 1948 team, when George Bourne ZL8UO was stationed on the island, but George was not very active during his tour of duty.

Old-Timers Club 50-year certificates were issued recently to O. W. Martin ZL2OZ of Dannevirke and C. J. Barnes ZL2QH of Masterton, marking milestones in their respective amateur careers.



POLAND

Jerzy Szymczak
78-200 Bialogard
Buczka 2/3
Poland

FM IN POLAND

Very popular in West Europe is a developed system of relay-station communication on ultra-short waves. Phased-out professional USW equipment usually gets to hams. Radiotelephones working on 144 MHz are no longer taken to pieces but are returned and used as local communications facilities. The USW Convention in Krzeszowice allocated frequencies of the FM subband 144 MHz to each province of Poland. This enabled directional antennas for attempts at long-distance communications and reduced the number of radiofrequency interferences.

The Polish firm Omig produced, and PRAA (Polish Radio Amateurs Association) distributed, several hundred sets of quartz-crystal resonators for different frequency channels. During several years of FM activity, Polish radio amateurs established many local contacts using nondirectional antennas with vertical polarization. They have been using radiotelephones as auxiliary means of communication trying to work on CW and SSB, too.

To not have too many irons in the fire, the greatest number of channels for every transceiver is necessary. Some attempts with variable-frequency oscillators or frequency synthesizers have been made. But at present it is not even possible to increase the number of channels by reduction of frequency spacing from 25 MHz to the European standard, 12.5 kHz, by reason of too broad quartz-crystal resonators or lack of them. The PRAA is going to repeat the order for crystals from Omig to improve the situation in some measure. For the time being, only one relay station, SR9E, working on R0 channel (input 145 MHz, output 145.6 MHz) enables a few hams to increase the range of their communication on the 144-MHz band. Polish hams expect that in the future they will be able to get newer types of radiotelephone and quartz-crystal resonators for 10.7 MHz, with frequency spacing at 12.5 kHz. This would create new possibilities.

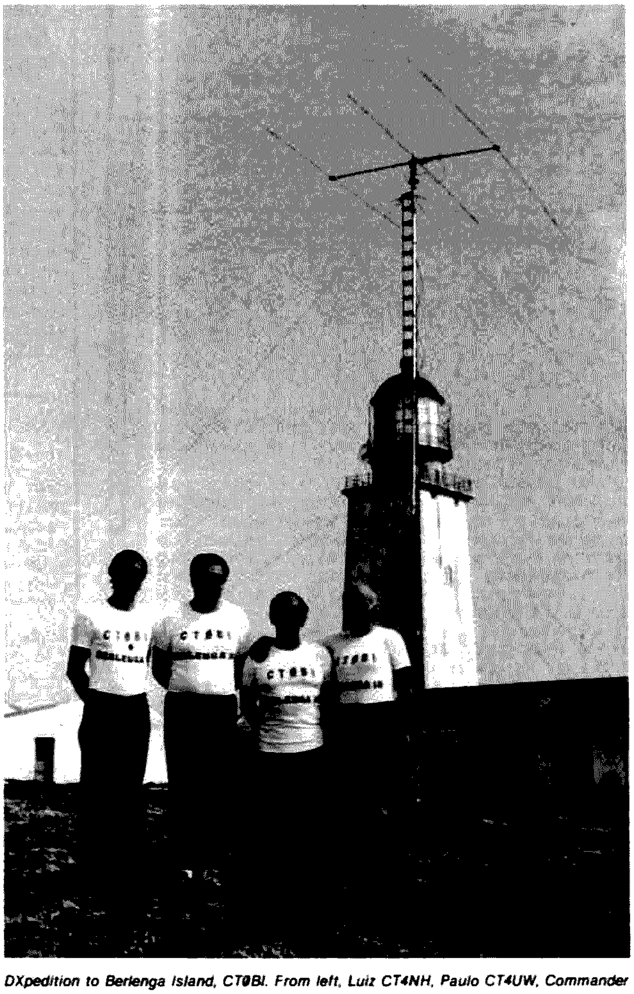
NEWS HEADLINES

State Radio Surveillance informed PRAA of rules of operational use of the amateur band, 1.8 MHz. The interval between 1830 and 1850 kHz is available for holders of the first-class licenses without limitation of power. The intervals between 1750 and 1800 kHz, 1810 and 1830 kHz, and 1850 and 1930 kHz can be given if seriously requested by interested individuals.

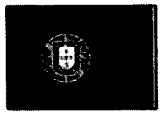
Licenses are being brought up to date in great numbers although there are some cases of refusals. The main Verification Board at PRAA took over the function of Appeals Committee.

Work on a revision of articles for PRAA has begun.

The Presidium of PRAA has initiated preparations for elections for the National Congress of PRAA.



DXpedition to Berlenga Island, CT0BI. From left, Luiz CT4NH, Paulo CT4UW, Commander Patricio, and Paiva CT1AFN, REP's vice-president.



PORTUGAL

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2765 Portugal

QRZ, THIS IS CT0BI, BERLENGA ISLAND, QRZ

As we said before, REP members CT1AFN, CT4NH, and CT4UW were active from Berlenga Island. We just received an update report about that event.

Having our very successful conversations with the Portuguese Navy and local telecommunications authorities, we got the necessary permission to operate from Berlenga Island (a natural reserve where one can find thousands of seagulls, rabbits, one donkey—known as Gerusa—and its favorite food, a very rare specimen of little flowers) with the special (very) callsign, CT0BI. It was assigned for the first time ever, so was a new one for everybody; also, the island was valid for the IOTA Award, with IOTA's reference number being EU-40.

Berlenga is the biggest of a group of islands (Archipelago das Berlengas) located 8 miles off the west coast of Portugal, at the location of the city of Peniche (50 miles north of Lisbon). It is famous for the surrounding transparent waters, making it the ideal spot for underwater exploration. There are monumental grottos like cathedrals of rock that in some cases cross through the island from one side to the other. It is 800 meters long and 300 wide, with the highest point at about 80 meters, where a lighthouse is located, under Navy jurisdiction.

Paulo CT4UW, Paiva CT1AFN, and I, and Frigate Commander Patricio, representing our sponsor (the Portuguese Navy), left for Berlenga in an old fishing boat, the *Ilha da Berlenga*, in bad weather—it was raining, with high winds, and the Atlantic Ocean was very hungry! After an hour of travel, we faced the problem of carrying all boxes, bags, masts, antennas, cables, etc., two miles to the top of the island. Fortunately (for us), Gerusa, the fat donkey, stopped for a while to eat those rare flowers and helped us with that job.

Very soon after our arrival, CT4UW and Patricio were erecting our TH3JR on the top of an existing 40' aluminum tower, still under strong winds and rain. In the meanwhile, I put up 40- and 80-meter half-wave dipoles, hanging them from the top of the lighthouse.

On March 14, at dawn, commemorating our first evening on the island, we experienced a terrible storm and a lightning hit directly on the top of the lighthouse, exactly 40 meters from the place we were sleeping! Fortunately, all rigs were left discon-

nected from antennas and power, so we had no damage, contrary to what happened in the lighthouse where all the electric cables and motors were burned.

Due to the fact that we were authorized to use the CT0BI call only on March 16, 17, and 18, we spent two days visiting the island with its marvelous landscapes and fishing and finished final details in our shack, located in the ex-radio room of the lighthouse.

Our rigs (FT-107M, FT-DX500, FT-101E, Drake VHF gear, etc.) looked very insignificant next to the Marconi transmitters and respective power supplies. Like big refrigerators, they "looked" at our Yaesu gear with a glance of superiority.

Testing 40 and 80, we noticed a high static level (crown effect in all coax cables) which led us to reduce our activity on those bands, avoiding burnout of the finals, saving them for the other 3 bands.

Our meals were splendid because our friend, Commander Patricio, was definitively a super cook! Dish of the day: beans.

At 0000 Friday the 16th, we began CT0BI operation. The first QSO on 40 was with CT1ALF.

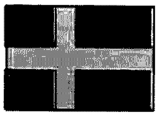
To be on the *other* side of the pileup (a sensation already experienced by the author during contests) was a new experience for the other two fellows, CT4UW and CT1AFN, respectively on HF and VHF, where they proved to be keen operators.

Being called by "hot DX" like HV3SD, T77V, and UVs on 40, plus being asked about QSL information... it's too much! We made 4071 QSOs, 1152 of them with US hams, a score possible due only to the fact that they really were very good operators.

The nice QSL cards were graciously offered by the Municipality of Peniche, and to end the story, I would like to thank Fonseca CT1CGO, who helped us from the beginning.

QSL information for CT0BI: CT4NH and CT4UW.

A brand new QSL card has been published by the Portuguese National Tourist Office, to be distributed free to licensed hams in this country. The front cover shows us a portrait of an antique map, as background, and an old Portuguese caravel of the 15th-17th century period. This color card has a very fine look, and we're really hoping for a second issue. Another effort of REP and PNTO.



SWEDEN

Rune Wande SM0COP
Frejavagen 10
S-155 00 Nykvarn
Sweden

W5LFL VISITED SWEDEN

Together with other astronaut colleagues, Dr. Owen Garriott W5LFL visited Sweden early in February. It was a short stay without publicity, but Radio Sweden International had a brief interview with Dr. Garriott on the DX program, "Sweden Calling DXers," on February 28. SCDX is aired every Tuesday as a regular and very popular DX program on shortwave.

Owen Garriott had been in Sweden once before, in 1953, when he was in the Navy aboard the *Vincennes*. On both occasions, W5LFL and Henry SM5WK met each other in Stockholm. Over 30 years had passed between these two meetings. Friendship through ham radio! Isn't it fantastic?

NRAU MEETING IN STOCKHOLM

The member societies of the Nordic Radio Amateur Union, NRAU, are EDR Denmark, FRA Faroe Islands, IRA Iceland, NRRL Norway, SRAL Finland, and SSA Sweden. This time SSA hosted the meeting held in Stockholm on March 17 and 18, 1984. It is of great value to get together and to be able to discuss common matters on a personal basis. We were especially happy that also Martin Haasen OY7ML and Kristjan TF3KB were able to travel this far to participate in the meeting.

Beside the Nordic matters, like review of the rules for the Nordic Championship in Amateur Radio Direction Finding (ARDF) and coordination of 2-meter repeater channels for repeaters located close to national borders, most of the time was spent on the hundreds of motions from Region 1 member societies to the International Amateur Radio Union conference in Cefalu, Italy, mid-April.

The wide variety of topics included a motion from the Radio Sports Federation, Soviet Union, "Compulsory of hosting national flags and playing anthems at the ceremony of awarding championship winners" in contrast to the one from Radio Society of Great Britain about uniformity in "the measurement and presentation of performance data on amateur HF receivers"!

ARDF NORDIC CHAMPIONSHIP

The Finnish SRAL is holding its annual summer-camp Field-Day week in Kuopio, Finland, which is in the OH7 call area. This time the Nordic Championship in Amateur Radio Direction Finding will take place during that event on July 21-22, 1984.

ANNABODA MEETING 1984

VHF-UHF-SHF enthusiasts have their summer get-together in Annaboda, a few miles west of the city of Orebro. Besides the fun of eyeball QSOing, there are a lot of antenna project activities. The antenna-gain competition is very popular. This year there will even be fox hunting (ARDF) on 10 GHz. Usually there are visitors coming also from the other Nordic countries and West Germany. This year it might be a little too early for the tourists as the dates for the meeting are June 8-10.

Martin Haasen OY7ML.

TRINIDAD AND TOBAGO

John L. Webster 9Y4JW
c/o Department of Soil Science
University of the West Indies
St. Augustine
Trinidad
West Indies

9Y LICENSES FOR NONRESIDENTS

We often are asked by amateurs planning to visit Trinidad and Tobago about the possibility of getting a 9Y license to allow them to operate during their visit. I shall attempt this month to outline what is involved and mention the problems faced.

At this time, the Republic of Trinidad and Tobago has reciprocity with only one other country in the world—the USA. Prior to 1976, the year that Trinidad and Tobago became a Republic, reciprocal agreements were in effect with all member countries of the British Commonwealth (UK, Australia, Canada, etc.). After 1976, these agreements were automatically cancelled. Unfortunately, the government here has not yet found it possible to renew these agreements, and this has complicated the issue of amateur-radio licenses to visiting hams. Each application from a non-US ham is, therefore, treated individually.

The TTARS has tried on several occasions to have the matter rectified but has had little success. This is apparently due to the fact that the new Telecommunications Act is being prepared.

Any US citizen visiting Trinidad and Tobago and wishing to operate here should be prepared to submit bona fide proof of US citizenship, along with both the original and photocopy of their US amateur-radio license, to the Telecommunications Officer in Port-of-Spain, the capital city. Only General-class or higher US licenses are submissible. It is not possible to apply for a license via mail, prior to arrival, as the interested party must apply in person to the officer for the license.

If the Telecommunications Officer approves, the applicant is given a letter to be taken to the Wireless Division of the Department of Customs and Excise who will then issue the license upon payment of the appropriate fee. A 9Y license costs TT$14.50 (or about US$5.95) when first issued and is renewed annually on its anniversary date at a cost of TT$9.60 (or about US$4.00). Visitors will be issued only a portable callsign, i.e., home call/9Y, unless they can provide proof that they will be resident in the country for a period of one year or more.

Any non-US amateurs visiting Trinidad and Tobago who would like to apply for a 9Y license are advised to bring with them all possible documentation to prove their qualifications, e.g., City and Guilds RAE certificate, in addition to their local license and passport. As mentioned before, each case is dealt with on its own merits and the TTARS is unable to assist in the matter.

There is, however, a more serious problem encountered by the visiting ham who wishes to enter the country with amateur-radio equipment. Unless the visitor has a valid 9Y license, the Customs Department at the port of entry will not allow the equipment to enter the country, and it will be detained until the license is obtained and produced. When the license is presented to Customs, the detained equipment will be released only either upon payment of Customs duties (30% of market value), with Purchase Tax of 45% payable on certain items such as linear amplifiers, or by posting a bond which is refundable after the equipment has been exported from the country. There are several catches related to the posting of the bond that are worth noting:

(a) The paperwork involved takes an average of ten days to complete.

(b) The services of a Customs broker are required to prepare the necessary documents.

(c) The broker must be paid for his services.

(d) It takes a minimum of three months, after the equipment is exported, before the bond is refunded.

(e) Refund of the bond cannot be made through the mail.

Unfortunately, the TTARS is unable to assist in this process at this time, although individual amateurs may be able to lend limited assistance if contacted and arrangements are made sufficiently in advance of the anticipated arrival.

NEW EXECUTIVE ELECTED

The Annual General Meeting of the TTARS was held on Monday, March 12, 1984. The following members were elected to office to serve for the 1984/85 year: president, "Nick" Percival 9Y4NP; vice-president, Ian Hart 9Y4IH; secretary, Bernard Ashby 9Y4BA; treasurer, Al Christopher 9Y4LF, and committee members, "Tony" Lee Mack 9Y4AL, Neil Wilson 9Y4NW, Frank Brooker 9Y4VU, Arnim Rudder 9Y4AR, co-opted, and Edward Hay and Denise Lee, associates.

DEALER DIRECTORY

PROPAGATION

J. H. Nelson
4 Plymouth Dr.
Whiting NJ 08759

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7A	14	14	14	14
ARGENTINA	21	14	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	14	14	7A	7	7	7	7A	14	14	14	21	21
ENGLAND	14	7A	7	7	7	7A	14	14	14	14A	14A	14A
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7B	7B	7B	7B	7A	14	14	14	14	14
JAPAN	14	14	14B	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14
PHILIPPINES	14	14	14B	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	7A	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	14	14	14	14A	14A	14	14
U. S. S. R.	7A	7	7	7	7	7B	14	14	14A	14A	14	14
WEST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	14	7	7	7	7	7	7A	14	14	14
ARGENTINA	21	14A	14	7A	7	7	7A	14	14A	21A	21A	21
AUSTRALIA	21	14	7A	7B	7B	7B	7	7	7	7B	14	14A
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14A	21A	21
ENGLAND	14	7A	7	7	7	7	7A	14	14	14	14A	14
HAWAII	21	14	14A	7	7	7	7	7	14	14	14	21
INDIA	14	14	7A	7B	7B	7B	7B	7A	14	14	14	14
JAPAN	14	14	14	7B	7B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7	7	7	7	7	7	14	14	14	14
PHILIPPINES	14	14	14	7B	7B	7B	7B	14B	14	14	14	14
PUERTO RICO	14	14	14	7	7	7	14	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	14	14	14	14A	14	14
U. S. S. R.	7A	7	7	7	7	7B	14B	14	14A	14	14	14

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	14	14	7A	7	7	7	7	7	14	14	14	14
ARGENTINA	21	14A	14	14	7	7	7	14	21	21A	21A	21
AUSTRALIA	21A	14A	14	14	7A	7A	7	7	7	7B	14	21
CANAL ZONE	21	14	7A	7	7	7	7A	14	14	14	21A	21
ENGLAND	14	7A	7	7	7	7	7B	7A	14	14	14	14
HAWAII	21A	14A	14	14	7A	7	7	7	14	14	21	21
INDIA	14	14	14	7A	7B	7B	7B	7A	14	14	14	14
JAPAN	14A	14A	14	14	14B	7B	7B	7B	14B	14	14	14
MEXICO	14	14	7A	7	7	7	7	14	14	14	14A	14A
PHILIPPINES	14A	14	14	14	14B	7B	7B	14B	14	14	14	14
PUERTO RICO	14A	14	7A	7	7	7	7	14	14	14	14A	14A
SOUTH AFRICA	7	7	7	7	7B	7B	7B	14	14	14A	14	14
U. S. S. R.	7B	7B	7	7	7	7	7B	14B	14	14	14	14
EAST COAST	14A	14A	14	7	7	7	7	14	14	14	14A	14A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

First letter = night waves. Second = day waves.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.
NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.

July

SUN	MON	TUE	WED	THU	FRI	SAT
1 G/G	2 F/G	3 G/G	4 G/G	5 F/F	6 F/G	7 F/G
8 F/F	9 F/F	10 F/G	11 F/G	12 F/G	13 G/G	14 G/G
15 G/G	16 F/G	17 P/F	18 F/F	19 G/G	20 G/G	21 G/G
22 F/F	23 P/P	24 P/F	25 F/F	26 G/G	27 G/G	28 G/G
29 G/G	30 G/G	31 F/G				

International Edition

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73 T.M.

Amateur Radio's Technical Journal

A CWC/I Publication

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Easy HW-101 Mods
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Load a

Two-Tone Tester—21

Arecibo—34

0 A 74470 65946

W2NSD/1 NEVER SAY DIE

ARE YOU GAME?

If you're into DXing, you've read about the two recent DXpeditions to the Republic Of China (Taiwan). One was Italian and the other Japanese...so I wasn't completely surprised when Tim Chen BV2A, for years the only licensed amateur on Taiwan, suggested that it was getting to be time for an American DXpedition to BV.

Tim talked to me while I was attending a computer show in Taipei. BV is still relatively rare, so I agreed that such an operation would be great fun...an opportunity for some American hams to experience the excitement of being on the business end of a DXpedition...but without the miseries you often have to go through.

Taiwan is a fantastic place to visit. There are friendly people, great food, incredibly low prices, and amazing sights. Even though I get there once or twice a year, I always look forward to it and enjoy it. I'd sure like to get you to Taipei for a few days; you'd love it. It would be a DXpedition you'd remember the rest of your life. Before I go into details on the DXpedition, let me tell you how I happened to be visiting Tim.

Commerce Tours runs a two-week trip every spring which coincides with computer shows in Tokyo, Seoul, and Taipei. Since it's important for me to keep up with micro developments worldwide, I try to make this tour. Also, this time I was looking for some computer products which I might be able to import.

Commerce was able to let me start a day late on the trip so that I could get an honorary doctorate degree and give the commencement address at Central New England College in Worcester, Massachusetts. Readers of my editorials will not be surprised to learn that I gave a talk on my favorite subject: how you, yes you, can get rich. It seemed like a good message for the graduating class of this outstanding college.

I was a bit intimidated when I saw that my commencement predecessors had been Ted Turner, Bob Hope, Malcolm Forbes, and Frank Perdue. While I hadn't heard their talks, I felt that mine might be of more personal importance to the graduates and certainly right in line with the school motto: "Yes, You Can!" It came off fine and the resulting enthusiasm got me started on an "I Can" book during my Asian trip. I wrote on my lap computer during flights, in waiting rooms, and on buses.

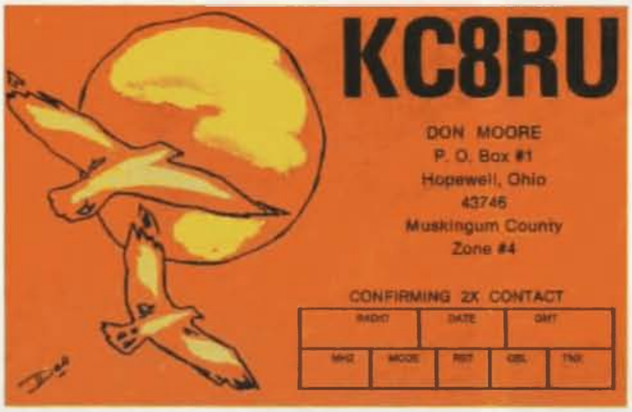
When the graduation ceremonies were done I was whisked to the airport for a flight to Los Angeles...and then Tokyo. There, we went to both a microcomputer show and an office-automation show, getting a full dose of both the low and high end of Japanese microcomputers.

The next step was Seoul, where the shopping is great if you like $9.00 New Balance sneakers and $10.00 Hang Ten suitcases, but it was a bomb for computers. An American outfit had taken over the yearly computer show and apparently alienated just about everyone. I think the whole show took less than ten minutes to see. The hundreds of small Korean computer firms passed it by. This was hard on our group, many of whom had rather good budgets for buying computer products for US distribution. Oh well, maybe we would do better in Taipei.

We did indeed. The Taipei computer show had over 200 exhibitors and much business was done. I got some excellent quotes on products I want to have made.

No trip to Taiwan is complete without an update on the ham

Continued on page 74



QSL OF THE MONTH

To enter your QSL mail it in an envelope to *73*, 80 Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

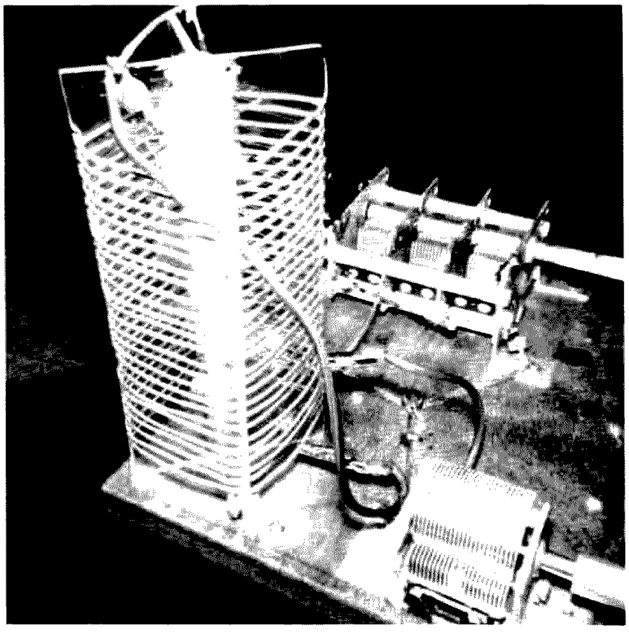
A. Lamendola KC2NT
225 Kaymar Drive
Rochester NY 14616

Top-Notch Tuner Time

Can't get your signal out of the backyard? Build KC2NT's antenna matcher and hear what you've been missing.

This tuner has been used effectively to feed the helical antenna described in the May, 1983, issue of *73*.[1] It is a developmental outgrowth of a random-wire tuner used successfully for many years with a 9.14-meter (30-foot) whip placed 15.2 meters (50 feet) above ground. The tuner has been employed with an endfed wire 19.5 meters (64 feet) long on 80 through 10 meters. It was recently used to load the house rain gutter pipe system to complete a Rochester NY/Pittsburgh PA QSO on 40 CW with 20 Watts output on my rig.

In development of this tuner, my goal has been to create a system for coupling a transmitter with 52-Ohm or 75-Ohm output to any 52- or 75-Ohm coax-fed antenna. The tuner assembly contains a couple of high-capacity condensers and a 12.7-cm-long (5-inch), 7.62-cm-diameter (3-inch) coil. However, *this circuit is not the familiar pi coupler device* as will be evident later on in this article. A noteworthy feature of the tuning unit is the greater selectivity exhibited on transmit and receive.



Antenna tuner showing the tuning-coil system and the common ground point for tuning capacitors.

Description

The general tuner configuration resembles somewhat a pi coupler output with an LC series-tuned input in place of the pi input capacitor. Filter tables describe the input system as a low-pass m-derived series half section. The output section is listed as a low-pass constant-k output half section. The fundamental tuner design is shown in Fig. 1. However, the tuner of Fig. 1 is easily simplified by replacing the series inductor as shown in Fig. 2. Note the optional capacitor bank of 3 × 500 pF. This is necessary on the 75/80-meter band with some aerials, e.g., the helical antenna. Upon close inspection of Fig. 2, one can see that the shorted portion of the coil is really two inductances in parallel with a ground return by way of the 500-pF tuning capacitor.

As the 500-pF capacitor is tapped at the various turns of the shorted inductance, the inductance of the paralleled coils changes in value. This method has proven quite effective in helping get the proper antenna-matching impedance. The 500-pF capacitor acts as a kind of band-spread device to cover small increments within the band from one end to the other. The output capacitor should require little trimming after it is set for the particular band. For some random antenna configurations, the tuner input/output connections are sometimes reversed; this seems to be especially true at the 20- through 10-meter bands.

Construction

My first tuner model used a length of B & W commercial coil, stock #3033. The unit is wound with #12 wire at 6 turns per inch. Coil length is 12.7 cm (5 inches) with a diameter of 7.62 cm (3 inches). My present tuner model has a very low cost homemade coil wound on a very simple and sturdy air-core form. Since #12 bus wire was unavailable at the local surplus outlet, I wound the coil with #14 bus wire. The coil was fitted on the form shown in Fig. 3.

Please note that this coil size should allow its use with transmitters in the 150-Watt-output class. However, when using a helically-

wound antenna with this power, a capacity hat must be installed at the antenna top. This eliminates corona discharge which will damage the aerial at the top end.

Fig. 3 shows two pieces of acrylic plastic sheet 1/8 inch thick, .3175 cm, fitted as shown. All dimensions are listed in the drawing. Epoxy cement is applied at points where the sheets come together at right angles to each other. This gives rigidity to the coil form. The winding grooves are separated 4 mm apart. The slits in both pieces should have the same width as the thickness of the plastic sheet. That will allow a secure fit for the two pieces.

In wiring the tuner, I found that a common ground point return for the capacitors was important to efficient operation. Also, it would be a definite advantage to mount the tuner components so that they may be easily interchanged and interconnected in configurations other than the one described in this article. That will allow the tuner to be configured with any and all antennas the user will ever encounter. However, my particular design has been used with random wires of varied types and has worked well.

Operation

Initial tuner settings should be determined with the aid of an antenna noise bridge. The tuner will allow close to 1:1 swr match of antenna-to-rig output of 52 or 75 Ohms. Since the device tuning is sharp, great care must be taken in using regular tuning procedure to prevent overloading and damaging the final amplifier. If an antenna bridge is unavailable, the tuner may be initially set by tuning the device for maximum signal output on the receive portion of one's transceiver. However, on transmit, a slight retuning is generally necessary. This must be done with great care, again, to avoid overloading the final.

With transceivers that have a continuously variable power-output control, e.g., Ten-Tec's Century 21, the following procedure may be used: First, adjust the rig's power output for indication of swr below 1.5:1, e.g., start at 1.2:1. Then peak tuner capacitors for 1:1 output. Increase power a bit more. If swr rises above 1:1, repeak the input capacitor and/or output capacitor. If an swr higher than 1:1 persists, either or both coil taps have to be varied. The variation of coil inductance may be as simple as sliding the clip along the turn in a plus or minus direction, or the variation may have to be as much as a turn or two plus or minus.

By way of further illustration, let us say that we wish to tune up at 7.040 kHz. We will use either a noise bridge or the alternate method just described and the helical antenna. Proper match is achieved when the tuning coil is shorted from the input end of the coil to the fourth turn from the output end. The input capacitor is connected at the seventh turn from the output end of the coil. The input capacitor is meshed in at about 65% of total capacitance. The output capacitor is meshed in at somewhat less than 50% capacitance. With these settings, the antenna bridge will indicate a deep null. This is the indication of a properly matched antenna.

In moving from one end of the band to the other, settings of the tuner are sharp. This means that retuning of the matching device is usually necessary every 5 or 10 kHz to maintain swr down to 1:1. To make sure that power is indeed at the antenna, a fluorescent lamp is put at the aerial end without touching it. If the antenna is loaded, the lamp will glow. Use of this aid is necessary only when determining the tuner's true settings. It is a backup check in forestalling any false indication of power transfer from rig to antenna.

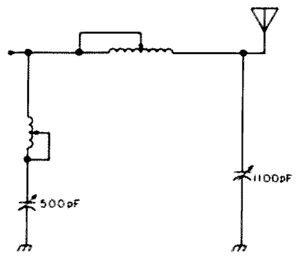


Fig. 1. Basic antenna-tuner circuit.

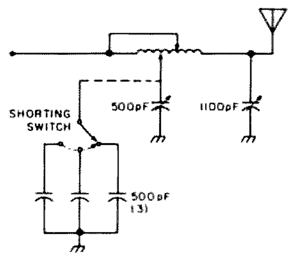


Fig. 2. Simplified antenna-tuner circuit.

Conclusion

Therefore, this tuner can match a rig to most any aerial and maintain an swr of 1:1. Because this antenna-matching device tunes sharply, additional harmonic filtering is available. The sharp-tuning feature is also evident on receiving; signals are peaked loudly and clearly. For those having capacitors in their parts box, the only other investment necessary is about 75¢ for scrap clear Lucite™ and one dollar for bus wire. When high-capacity condensers are unavailable, 365-pF capacitors with paralleled switched fixed condensers may be used.

The tuner design has been in service for many years, over 15 in all. One proof of its utility has been the longevity of the finals for my two rigs, one solid state, the other vacuum tube. The tubes are TV horizontal types. The transistors are 4-Watt types operated with a very short duty cycle at 20 to 35 Watts power output. The tuner capability in maintaining a 1:1 swr has greatly enhanced the life of the final amplifiers. ■

References

1. A. Lamendola KC2NT, "Talk Softly and Load a Big Stick," *73*, May, 1983.

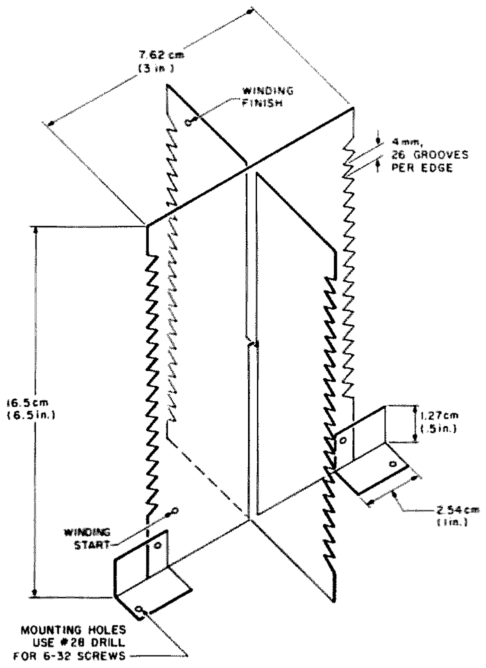


Fig. 3. Clear plastic coil form.

Bob Engle K9QLL
RR 2
Franklin IL 62638

Cheap Power Ploy

This rugged supply will give you more power than you ever dreamed possible. Have we gone too far this time?

Looking for a 12-volt power supply of moderate current, I found a schematic and information that promised to be just what I needed. The supply was constructed following the guidelines and recommendations; upon completion, it was checked and put into service. Then the fun began.

The supply was essentially the same as shown in Fig. 1 and was to provide between 3 and 20 Amps output (peak) at 12 volts. It did indeed do this, but it also put out about 1/2 to 3/4 volts of assorted garbage that drove the equipment that it was operating into fits of sulking and, even worse, *almost* proper operation.

While some of the equipment that is designed for use with vehicular power sources is fairly immune to power-line noise, this is not the case with most dc-operated equipment. Spikes, ripple, and assorted other garbage can cause lost memories, lousy audio, and a host of other problems. It makes no sense to attach a kilobuck piece of gear to an inadequate supply.

The supply to be described here is the result of solving the problems of the original supply (Fig. 1). While the original was not designed for ham gear, the five supplies built to this pattern (Fig. 2) have proven excellent for everything from high-power stereo gear to allband transceivers.

The supply was designed to be built using parts that are cheap and readily available. The use of surplus components dictates a certain amount of caution but can result in an excellent product at a minimum price. With a little care and some improvisation with regard to transformers, the price of this supply should be under \$50.00—considerably under \$50.00 if you're a bargain hunter with a sharp eye.

What about specs? This supply will provide (depending on components chosen, of course) between 15 and 30 Amps (or more) at 5 to 28 volts with ripple and noise at about 5 to 10 mV p-p and regulation usually within .05 volts or so. There is full thermal protection and the usual provisions for current limit and OVP (over-voltage protection).

First, let's take a look at the supply in Fig. 1 and see where it goes wrong. Starting with T1, which provides 18 V ac to the bridge rectifier, and then to C1, which is 70k µF, we have about 25 V dc to the pass-regulator circuit under no-load conditions. The regulator and pass transistors require a voltage at

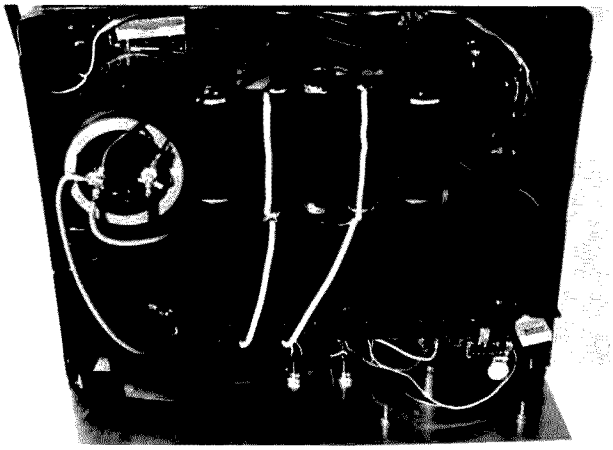


Photo A. Interior of 25-Amp supply showing position of major components and airflow shrouding.

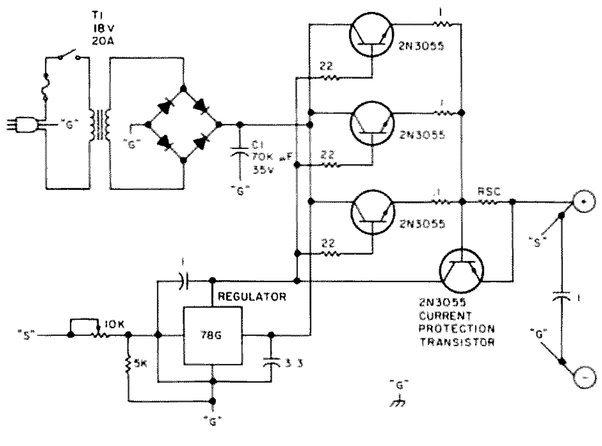


Fig. 1. Original supply.

least 5.6 higher than the output voltage to maintain regulation 13.6 V + 5.6 V = 19.2 V. If at any time the input voltage drops below 19.2 volts, the regulator loses control and the output changes.

The voltage across C1 has a waveform as shown in Fig. 3. As the current increases, the hump at the front increases. This is the principle component of the output ripple and is due to the fact that the rectifiers conduct for a short period of time to charge the capacitor. Increasing the capacitance simply increases the amplitude of this "spike," which makes the problem worse and increases the already high demands on the diodes in the bridge.

In addition, the regulator was unstable at certain currents and seemed to put out more hash than the spec sheet called for at this voltage (about 10 times more!). Bypassing and rewiring the ground circuit got rid of the hash, and increasing the input voltage improved the regulation and ripple problems. The supply proved OK for a 2-meter amp that didn't seem to care about the ripple (.2 V at 20 A), but it wouldn't serve the purpose it was originally built to serve.

At this point, I priced commercial supplies and immediately went back to the drawing board. After some research and experimentation, the supply shown in Fig. 2 was built and tested. It worked. The four supplies built to the same pattern have all worked.

The belt-and-suspenders approach has proven to be well worth the time and slight additional cost. Actually, with the price of 2N3055s at three for a buck and the use of smaller and cheaper capacitors in what is really a simple circuit, the actual cost was not much more than the original supply.

Let's now see the how and why of the "quiet" supply. The bridge rectifier uses surplus diodes rated at 100 V and 50 Amps; this seems like overkill and perhaps it is, but the peace of mind bought for $1.25 each was worth it. With C1 at 25k μF, the conduction spikes can get up to ten times the output current, so they really don't represent that much overkill after all. C1 is 25k μF at 75 volts because I got a box full for $1.00 each. R1 is simply a bleeder and should draw about 100 mA at the peak no-load voltage across C1.

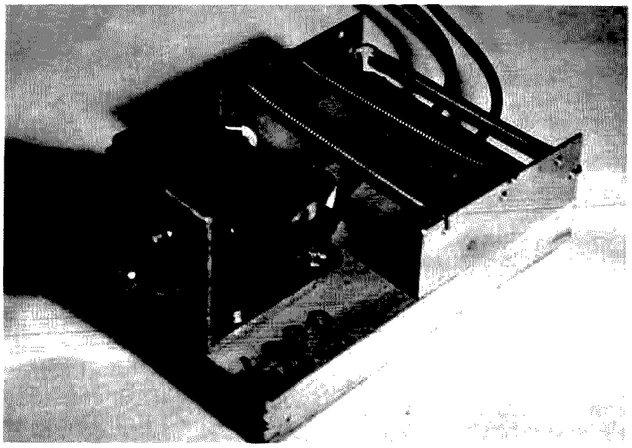


Photo B. Load resistor for testing.

T1–T4, ZD1, R2, and C5 form a circuit that thinks it is a multi-farad capacitor. The capacitance of C2 is multiplied by the beta of the Darlington circuit formed by T1–T4. The current demands on T4 are not enough to require a 3055, but they're cheap. I simply selected one with a beta of about 60 for the driver. This particular circuit is about 10 *farads* effective capacitance and the output ripple to the regulator is less than .2 volts at 20 Amps (p-p). ZD1 provides a clamp to keep the input voltage to the regulator at 24 volts in this case.

The regulator circuit is based on the 78G (or 78MG) because I like it. It is a good, flexible chip that is protected four ways from Sunday, and it is cheap.

The 78G will provide over one Amp of output, with the average beta of a 2N3055 at 40 or so. The circuit should be good for 40 Amps. Actu-

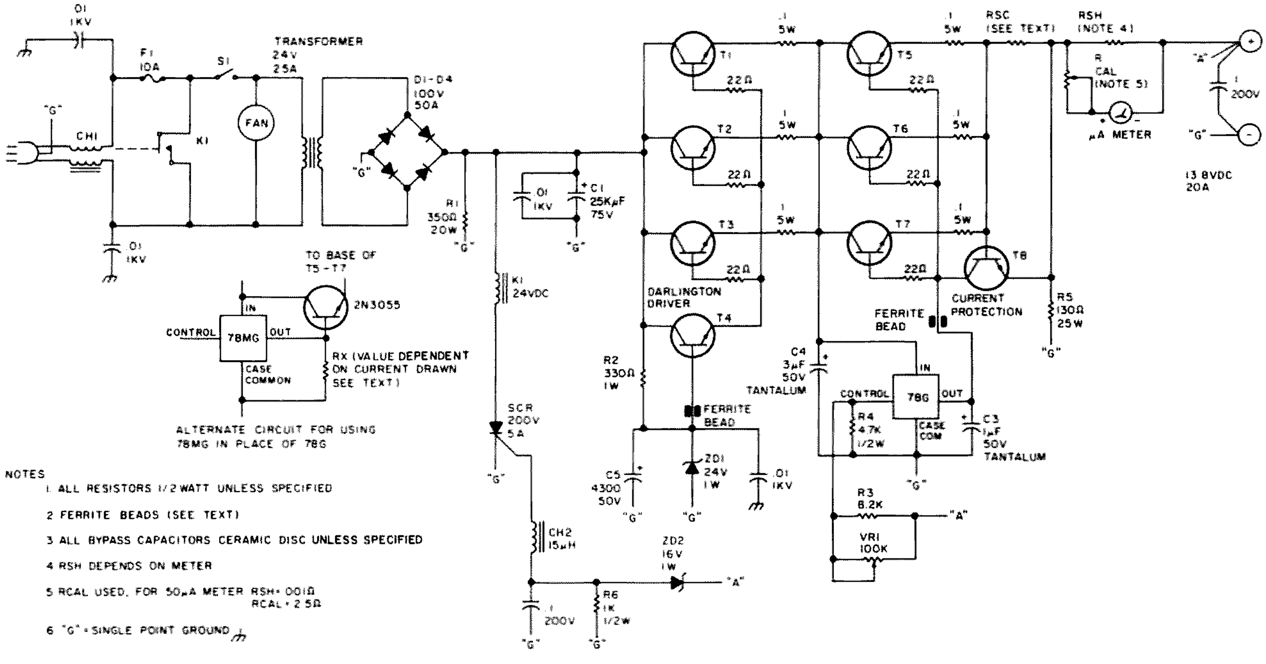


Fig. 2. Schematic (all transistors are 2N3055).

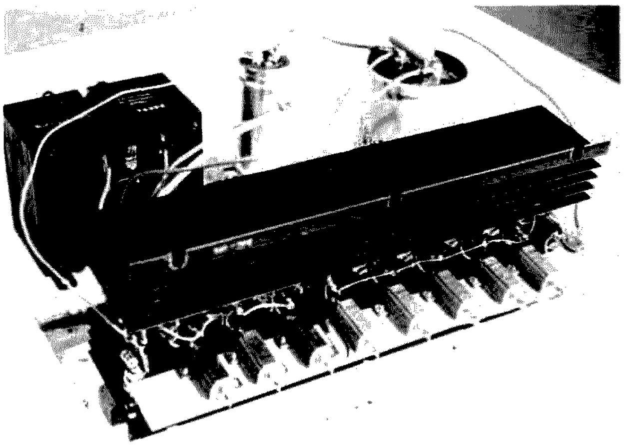


Photo C. 25-Amp supply on the breadboard.

ally, above 25 Amps or so, the use of the Darlington circuit is a good idea. When using the 78MG, the Darlington circuit *must* be used. When using the Darlington circuit, the current demands are so small that the chip may need the slight load, RX. This value will depend on the individual chip and is usually 300 Ohms to 1k Ohms for a 13.5-V supply.

R3, R4, and VR1 set the output voltage. R3 is used to set the maximum voltage and VR1 trims this to the desired lower output voltage. With R3 at 8.2k and VR1 at 100k, this will be about 14 V maximum. The connection point for R3 should be at the output connector or, if remote sensing is needed, it can go to the remote sense point. The resistors shown in the base and emitter leads of the pass transistors are absolutely necessary. They prevent one transistor from hogging all the current. The base resistors are not particularly critical as to value, and 10 to 22 Ohms will do fine (all the same value, of course). The emitter resistors should be about .1 Ohms and 5 to 10 Watts, depending on supply voltage, current, and the number of pass transistors.

The number of pass transistors required will depend on several factors, the most important being the desired output current of the supply.

The 2N3055 is rated at 15 Amps and 117 Watts (TO-3 case) at 25° C. Expecting one to provide both at the same time is an invitation to disaster, especially with surplus components.

Let's take a realistic look at what the requirements will be for this supply providing 13.6 volts at the 20-Amp level. The regulator will need approximately 6 volts to work properly, so under a 20-Amp load it will have to dissipate about 120 Watts. The capacitor multiplier at 20 Amps will need about 5 or 6 volts, so we now have 240 Watts at full current. This has to be dissipated as heat via the heat sink and is one good reason for derating the transistors. Derating surplus transistors to 8 Amps (or preferably less) and 50 or 60 Watts will make for a longer life and lessen the chance of catastrophic failure.

The output resistor, R5, provides a constant minimum load for the supply and helps with stability (100 mA or so will be adequate—130 Ohms for the 13.6-volt supply).

If you look at the circuit and remember your solid-state basics, it can easily be seen that we have an amplifier with quite a bit of gain. Certain steps must be taken to ensure stable operation and to prevent amplification of unwanted signals. As Elmer used to tell me, "Build it like you mean it." In this case it means bypassing everything, especially the 78G. All those G points on the schematic mean that all grounds are brought to a single point on the chassis. More about this during the mechanics discussion. The ac line should be filtered and bypassed, and the case should be rf tight, in this case to keep it out rather than in. Ferrite beads on the base leads of the Darlington driver(s) are not a frill if powering VHF equipment is contemplated.

The heat sink used is one that seems to be common on the surplus market. The ones that I bought came with four TO-3 transistors and miscellaneous parts and cost about $3.00 each. The heat sink is 12" × 4" × 2.5" with 10 fins for a total radiating area of 600 square inches. All of the hot parts are mounted on the heat sink using aluminum stock, as shown in the photos. The bridge can be mounted on its own sink or on an extension bolted to the pass sink. A muffin fan (105 cubic feet per minute) provides cooling, with cardboard shrouding to direct the air flow through the heat sink. The 78G is mounted on the end of the heat sink farthest from the fan at the hottest point. If thermal limits are exceeded, it shuts down the pass transistors. Many home-built supplies fail to take advantage of this feature which is built into most regulator chips. This is an oversight that can prove costly.

Construction/Mechanics/ Testing Options

This supply is a definite breadboard project and should be approached as such (by the way, sink cut-outs make fancy, cheap breadboards). I prefer TO-3 devices, used with sockets.

Photo D. Heat-sink assembly for 20-Amp supply.

Fig. 3.

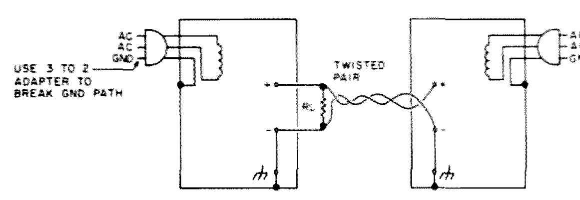


Fig. 4.

Whatever package style you use, special care should be taken in mounting. All burrs should be removed and the best-possible contact between the device and the heat sink must be ensured. This means using heat-conducting compound on all devices. As you install each device, verify that there are no shorts to the heat sink. The precision emitter resistors that I used were hamfest specials, but the ceramic ones available at most parts houses will serve as well. Use #10 or #12 wire for the collector and emitter buses. I simply stripped out some scraps of Romex left over from rewiring the shack. The main run wiring used was #10 or #8 THHN wire scrounged from an electrical contractor's scrap box.

The heat sink is at ground potential but is insulated from the case. Grounding is accomplished by running a single wire from the common connection of the 78G (the 78G is *not* insulated from the sink) to the ground common point. *All* ground connections are brought to the common point, using heavy wire that is as short as possible. The lines from the capacitors, the rectifier, the negative output post, and the ac-line ground conductor are connected to this point. This prevents ground loops and helps to keep the output clean.

Cardboard shrouds are used to focus the air flow through the sink and provide for efficient use of the cooling air. The case should be well ventilated. Transmitter techniques can be used for rf proofing. All of the usual transformer tricks can be used for your supply: buck/boost, series, parallel, etc. I do have a couple of suggestions that might prove handy.

First, there are available surplus small transformers that provide 2 volts or so at up to 30 Amps (Fair Radio is one source). These are great when the "main" transformer is just a bit low.

Second, an often-overlooked source for high-current transformers is gas stations. Really! Those old Tungar bulb chargers had some bodacious transformers in them with multi-tap primaries and secondaries. Many times they can be had for hauling them off. (Take help!) Newer ones also are available after the selenium bridges have blown. Those with aluminum secondaries will need some of the special grease for making good connections to aluminum wire. If you're using the supply to power an SSB rig or for other low-duty-cycle applications, you can push the transformer current ratings a bit, but it is best to have a bit of reserve for good dynamic performance.

Protection circuitry is an absolute must for this supply if used with voltage-sensitive equipment. Any of the popular OVP circuits may be used; the one used here crowbars the ac line using a simple circuit that costs less than a single high-current thyristor.

Current limiting is nice also; the circuit used here is a common one and performs quite well. Rsc is set for a .7-volt drop at the desired current level. At this point the voltage will drop to hold the output current at this level. Rsc can be built up by paralleling standard values. Rsc should be in the airstream to keep it cool. The choke and capacitor on the gate of the SCR keep garbage on the line from causing false firing. Switching high-current loads can cause this type of transient. (I blew a few fuses before I figured that one out.)

This supply should be breadboarded and tested before final construction. This is not a complicated process, and it will pay dividends when the supply is put to use. As with any homebrew project, you are spending time rather than money. This is time well spent.

The first step is to assemble the heat sink with all its components. Then a simple test to determine the necessary I/O differential voltage is needed. With a sensitive DVM and a light load on the output, vary the input voltage until the output drops an mV or so. This is the voltage which must be supplied to the pass circuit to maintain regulation. You now know the necessary voltage that the transformer must supply under full load for proper operation.

To test the supply under load, you will need a load resistor (see photo). One is made by paralleling several short pieces of nichrome heating coil. (I got 10 feet for $3.00 at the local electrical-supply house.) By adding more pieces in parallel, the current increases. If you didn't build an ammeter into the supply, a 7-7/16" length

Parts List

Note: This supply was designed to take advantage of surplus parts. Therefore, the prices listed will be dependent on the source and availability of each item.

All bypass capacitors are ceramic disc unless otherwise specified.
All resistors are ½ Watt unless otherwise specified.

Bypass—.01, 1-kV disc, 4 @ .25 ea.	$1.00
Bypass—.1, 200-V disc, 2 @ .25 ea.	.50
K1—relay, 24-V-dc coil, 3PDT, all contacts in parallel	1.50
Fan—105 cfm muffin-type fan	7.50
Xfmr—any combination of transformers supplying the necessary voltage and current may be used. The surplus xfmr used in Fig. 2 was 24 volts @ 25 Amps.	18.00
D1-D4—100 V @ 50 A used in this supply, 4 @ $1.25 ea.	5.00
C1—25,000 µF @ 75 V	1.00
Cs—4300 µF @ 50 V	.39
C3—1 µF @ 50 V tantalum capacitor	.39
C4—3 µF @ 50 V tantalum capacitor	.39
Resistors:	
R1—350 Ohms, 20 W	.39
RC5—130 Ohms, 25 W	.39
R2—330 Ohms, 1 W	.15
R3—8200 Ohms, ½ W	.05
R4—4700 Ohms, ½ W	.05
R6—1000 Ohms, ½ W	.05
Base resistors—22 Ohms, ½ Watt, 6 @ .05 ea.	.30
Emitter resistors—.1 Ohms, 5 Watts, 6 @ .35 ea.	2.10
VR1—100k-Ohm trimpot	.49
Rsc—current limit, see text	
Rsh and Rcal depend on meter used. For 50-uA meter used in Fig. 2, Rsh was .001 Ohms, and Rcal 2.5k-Ohm trimpot.	
Transistors—2N3055, 8 @ .33 ea.	2.64
SCR—200 V @ 5 Amps used here	.29
ZD1—24-V, 1-Watt zener diode	.24
ZD2—value depends on OVP desired. (16 V used for 13.8-V supply)	2.64
78G—Voltage regulator	2.95
CH1—14 bifilar turns #14 wire on ferrite rod approx. ½" diameter, 4½" length	2.00
CH2—surplus 15-mH choke	.25
S1—15-Amps @ 120 V toggle switch	1.49
F1—10-Amp fuse in clip-type holder.	1.25
Heat sink—surplus 2½" × 4" × 12"	4.50
Meter—50 uA used in Fig. 2 supply, surplus	3.00

Misc. case, hardware, aluminum stock, suitable wire (see text). The case shown in the photos is 5" × 12" × 15" and was purchased at a hamfest for $1.00.

Substitution: Since this project is designed to use surplus components, reasonable substitutions are to be expected. When surplus components are used, derating should be the rule. C3 and C4 must be tantalum capacitors for proper operation. The resistors used at R1 and R5 should be capable of dissipating at least twice the I × E power for safety and stability.

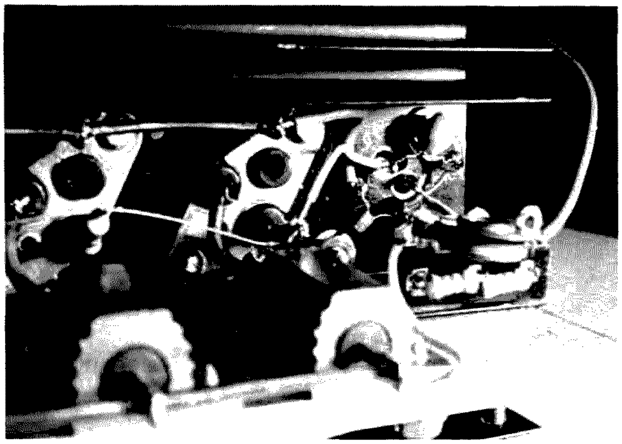


Photo E. Detailed view of 78G wiring (note short leads on bypass).

of #12 wire will serve as a shunt, providing 1 mV per Amp. Using the setup shown in Fig. 4, look at the output under load. The setup prevents ac ground loops from showing up as false noise on the scope. If the scope is not more sensitive than .01 V per cm, the trace should barely widen under full load. Check at several output levels. If you have inordinate noise, make sure the setup is right before troubleshooting. At the current-limit level, using the circuit shown, there will be a large increase in ripple—this is normal. If Rsc needs to be lowered, it can be paralleled with additional resistors.

If the output behaves up to a certain current level and then falls off, more input voltage may be necessary. When testing the supply on the breadboard without the fan, the heat sink gets hot quickly—caution! If it gets too hot, the 78G will shut down until things cool off. If you have high-frequency hash, it may be necessary to add .01 discs to the input and output of the 78G. In stubborn cases, you may have to change the layout around the 78G. If the supply is unstable at some current levels and stable at others (higher), you may have a ground-loop problem. Try changing the lengths of ground leads and if you're using the Darlington circuit for the regulator pass, try decreasing the value of RX.

One of the supplies that I constructed is variable from 5 to 20 volts (VR1 on the front panel and a switch to use all or part of the secondary) at 20 Amps. It has proven to be one of the most often used bench tools I have. Another smaller (12 V at 15 A) supply provides the dc for a TV-studio installation. This supply is, of course, a compromise; you pay back in lack of efficiency for a clean stable output. "Build it like you mean it," and it should provide you with a long trouble-free performance—quietly. ■

References

Application Note 90, "Performance Measurements," *Hewlett Packard, 1968 DC Power Supplies Catalog and Handbook*, p. 72-73.

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73, "A New Breed of Voltage Regulators: Throw Away Your Old 309s," March, 1977, p. 62-64.

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Penn Clower W1BC
459 Lowell Street
Andover MA 01810

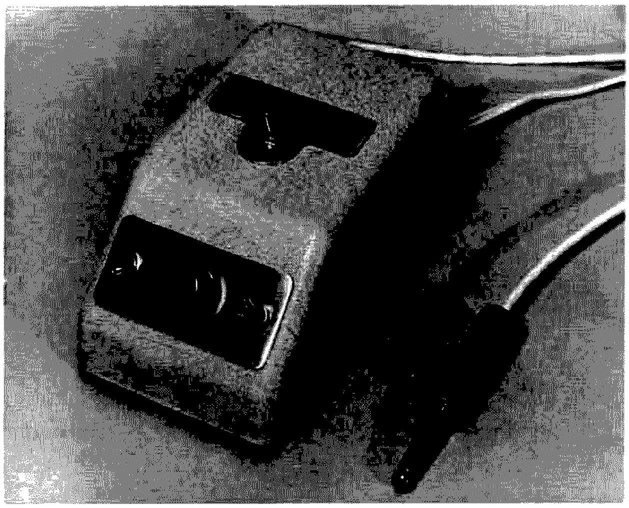
Penn's Two-Tone Gadget

Clue one: We're talking about lab quality.
Clue two: Get your junk box.

Here's a professional-quality two-tone tester designed for easy duplication. Using no precision parts and having only two easily set internal adjustments, it generates sine waves with less than 0.1% total harmonic distortion. This inexpensive project can be built with all new Radio Shack components for $30 to $40. The cost can be reduced significantly if you use a battery for power and your junk box for some of the parts. It's sure to be a valuable addition to your collection of test gear.

If you've ever repaired or tested an SSB transmitter, then you've used or needed a two-tone test oscillator. A dependable source of high-quality sine waves, the oscillator can be used for any number of transmitter tests. Typical applications include checking circuit gains, peaking tuned stages, adjusting phasing exciters, checking or setting ALC thresholds, and measuring amplifier linearity.

Photos by W1GSL



Small enough to be out of the way, this neat unit is big on quality and convenience.

Unfortunately, many of the published two-tone circuits are of limited use because the output waveform is not pure enough for some tests. A good linear amplifier, for example, will have odd-order intermodulation products 35 to 40 dB down from the desired output. Obviously, the two tones used to measure such performance should be at least that good when they go in the microphone jack. Minus 40 dB is only 1% distortion though, and many testers are incapable of generating waveforms that pure.

The published circuits which do provide sufficient audio purity often attain it through the use of sharp audio filters. Those filters require either high-quality components or several circuit trims to keep them on the right frequency. Precision parts work fine but are difficult to find and expensive to buy. Lower-quality components need to be selected or trimmed and even then may drift enough to require frequent readjustment.

The oscillator described here has a number of features making it a better choice for the amateur test bench:

- All distortion products are at least 60 dB (typically 65 to 70 dB) below the primary output. That's good enough for taking even a hard look at state-of-the-art equipment.
- The unit can be duplicated using everyday parts (5% resistors and 20% capacitors) because purity has been achieved by careful oscillator design and not heavy filtering.
- Unlike most commercial equipment, this unit is physically small, rugged, and well shielded. When you need it, it works; when you don't, it isn't in the way.
- The box plugs right into the transmitter microphone jack and includes a handy

switch for keying the transmitter. The adjustable (1 vrms maximum) audio output is sufficient for driving rigs having either high or low impedance inputs.

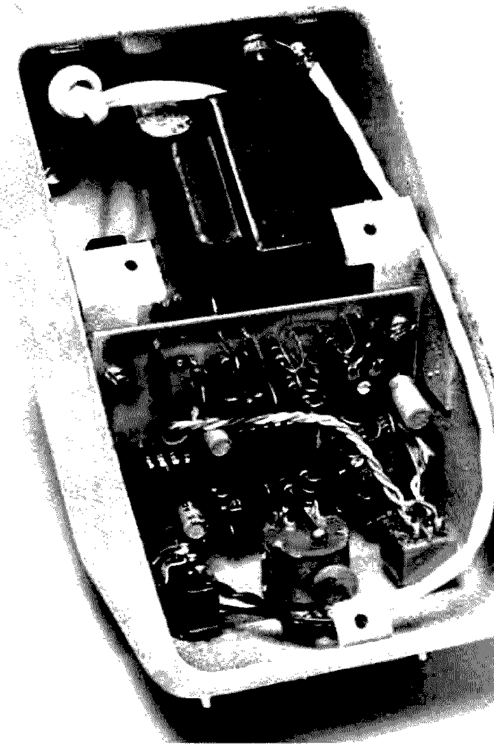
- Power drain is only 12 mA at 9 volts, so you can run the unit from a single 9-volt battery and not worry about limited battery life.

The Circuit

The two oscillators are designed around an LM324 quad op amp as shown in Fig. 1. Each oscillator is followed by a simple peaked low-pass filter and the two signals are combined in the 741 output amplifier. Switching is provided for selecting either or both tones and the output level is adjustable over two ranges covering 0 to .18 and 0 to 1 volt rms.

The identical oscillators are carefully considered versions of the classic Wien Bridge oscillator circuit (see the sidebar, "On the Trail of the Wien Bridge," elsewhere in this article). The sine waves produced by these oscillators have only about 0.5% distortion. The frequency of oscillation is determined by four components: the series capacitor and resistor between the op amp's output and its non-inverting input terminal, and the parallel capacitor and resistor between there and ground. The oscillation frequencies with the components specified in Fig. 1 are 500 and 1750 Hz (not the 440 and 1600 Hz labeled on the photographed unit).

The remaining components in the oscillator circuit provide dc biasing and set the loop gain to unity. The trim resistor is used to adjust the small signal gain a little higher than required to sustain oscillation, and then the diodes and 470k resistor in the feedback path reduce the gain by 10% when the output signal grows larger than about 1 volt peak to peak. Overall



The 9-volt power supply takes up most of the room inside. Current drain is only 12.5 mA, so battery operation is an attractive space- and money-saving option.

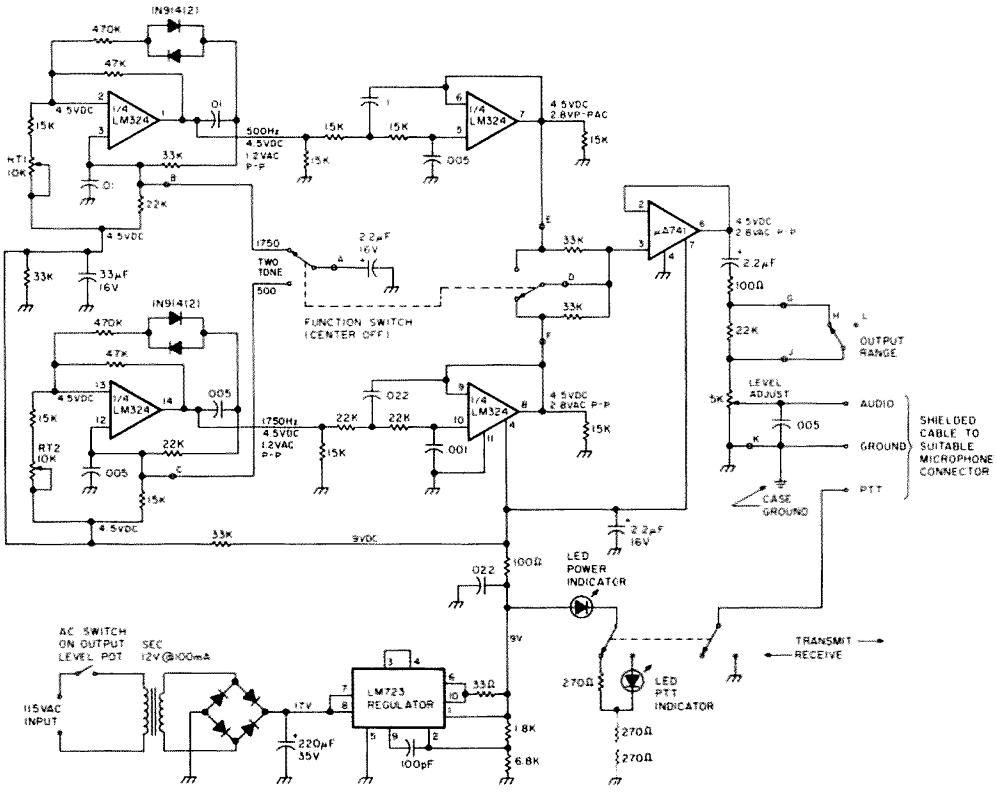
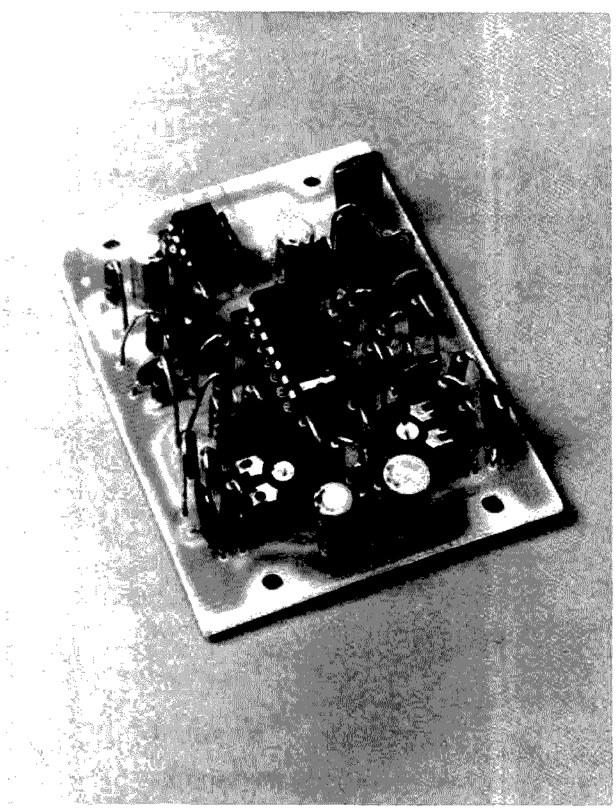


Fig. 1. Two-tone oscillator schematic. Resistors are ¼ W, 5%. Letters shown where wires leave PC board (see Fig. 3).



Standing components on end lets everything fit on the 2" by 2.7" PC board. More real estate might be necessary if you build with perf or prototyping board.

distortion is low because even this relatively minor gain reduction is applied gently as the diodes turn on.

The distortion introduced by this type of gain control is mostly at the third harmonic of the oscillation frequency. An additional 5-dB reduction of that component is realized by driving the diodes and 470k resistor from a point after the feedback capacitor instead of directly from the amplifier output as is usually the case. Even with this change, the third harmonic signal is still some 10 dB higher than the second harmonic. In a sense, this is desirable because the third-harmonic energy, being farther from the fundamental frequency, is easier to filter off.

The oscillator outputs are dc-biased to half the supply voltage by a simple resistive voltage divider. That step maximizes the output ac level possible before the amplifiers saturate. Each section of the quad amplifier is also dc-loaded with a 15k resistor. The load resistor prevents crossover distortion by forcing the rather simple LM324 output circuit to operate strictly as a class-A amplifier.

One design goal for this project was to have all undesired frequency components at least 60 dB below the primary outputs. To achieve this, the oscillators are followed by low-pass active filters. Since the oscillator outputs are so clean, this goal can be reached with only a small amount of filtering. That's significant because it means the filter stages don't have to be held to tight frequency tolerance and so won't require precision parts. The filters have a gain of one at dc and a peak ac gain of 2.25.

The dc gain causes the filter output to copy the oscillator biasing at half the supply voltage. The ac gain ensures that with overdrive the filter output will begin clipping before the oscillator output does. If the oscillator could somehow saturate first, it might be possible for the misadjustment to go unnoticed because the filter would tend to hide the evidence. Another benefit of having gain in the filter stage is that the oscillator output level can be lowered. That reduces distortion because the feedback diodes don't get turned on as fully as they would at the higher signal level.

The outputs of the two low-pass filters are combined in a 741 amplifier which in turn is ac-coupled to the output attenuator. The 741 does not need the 15k load resistor because its sophisticated output circuit doesn't have the distortion problems of the simpler LM324.

After passing through the output-level control, the audio leaves the box in a shielded cable it shares with the push-to-talk line. The microphone plug on the end of this short cable should match the transmit-

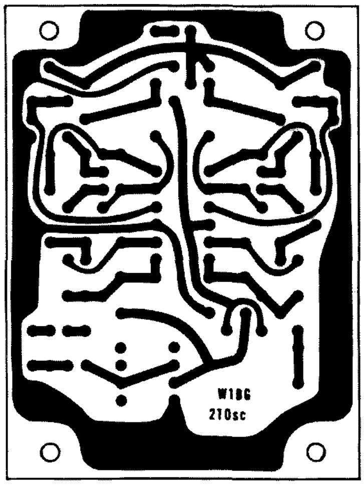


Fig. 2. PC pattern of audio circuits from the copper side of the board. This pattern can be used as an etching/drilling guide as explained in the text.

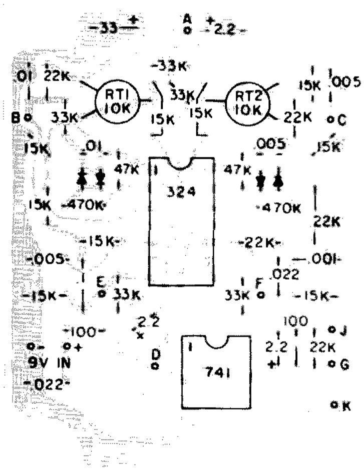


Fig. 3. Component placement (from the top side of the board).

ON THE TRAIL OF THE WIEN BRIDGE
Selecting a Good Oscillator

There's certainly no shortage of published audio-oscillator circuits, but finding the right one for this two-tone tester wasn't easy. The requirements (low distortion, simplicity, low power consumption, and reliability) seem common enough, but the circuits usually recommended for the task all had flaws rarely mentioned in the literature. Mostly those flaws involved the means chosen to control the oscillator gain.

An oscillator is really an amplifier around which has been placed some frequency-sensitive positive feedback. The combination of amplifier gain and feedback attenuation is called *loop gain*, and at the frequency of oscillation, the loop gain is *exactly* one and has *exactly* zero phase shift. That's another way of saying that the signal presented to the input of the amplifier is precisely the one needed to produce an output which will come back through the feedback network to reproduce itself. The phase shift across the feedback circuit is frequency-sensitive, so any departure from zero loop phase can be corrected by a change in the oscillation frequency. Unfortunately, any departure from the desired amplifier gain is a little harder to accommodate.

Since real-world components are imperfect, we can't simply specify parts that give the magical gain of one, but we can design in circuit features which will automatically adjust the gain for us. The easiest thing to employ is the most widely used: saturation. Saturation, or peak clipping, is what happens when an amplifier is asked to produce more output than it possibly can. Gain is defined as the ratio of output to input, and as saturation occurs, the effective gain must drop since the output amplitude remains nearly constant while the input drive increases. Saturation clearly introduces distortion and most simple sine-wave oscillators have distortion in the 5-to-15% range because they depend on saturation effects to maintain the loop gain at unity.

Modern laboratory oscillators usually achieve low distortion by using sophisticated agc circuits to regulate gain. Early equipment did the same thing by the clever use of a nonlinear component: the tungsten filament of a common panel lamp. The resistance of the bulb filament goes up as the average current through the lamp increases, and very good gain control can be had by the proper application of that effect. The classic lamp-stabilized Wien Bridge oscillator is a very elegant circuit capable of producing extremely pure sine waves. It was devised in the 1930s, in part by a young engineer named William Hewlett who later formed a company with his friend David Packard to manufacture the oscillator.

The modem version of that circuit, shown in Fig. A, is reproduced in almost every text discussing audio oscillators. The light bulb is driven with a signal proportional to the oscillator's output. The filament resistance averages that output over several tenths of a second and so controls the oscillator gain to exactly one. Oscillator distortion may be as low as .01%.

Unfortunately, the thermal properties of the lamp filament introduce a tendency for the output amplitude to ring at a frequency near 10 Hz. This secondary oscillation can be started by the slightest circuit disturbance and may take 10 or 15 seconds to decay away. The commonly available lamps used in this circuit also require more drive voltage than a 9-volt battery provides. Moreover, the circuit needs 15 to 20 mA of supply current per oscillator and that seems excessive for a battery-powered unit which doesn't really have to deliver any output power. Together, these several considerations make the circuit of Fig. A undesirable for this project despite its excellent output waveform.

The next commonly recommended circuit, shown In Fig. B, is usually offered as a modern replacement for the classic arrangement because it uses a JFET as the variable resistor instead of a light bulb. Unfortunately, a JFET does not make a good resistor since its resistance varies with the drain-to-source voltage as well as the gate-to-source bias. That means the resistance will be changing during each oscillation cycle, and the changing gain that causes leads to problems. Distortion was a terrible 5 to 10% with the several circuits I tried. The variations published most often were the poorest performers because the zener diodes in the output-level detector *guaranteed* the FET would be operated outside its linear range!

The circuit type finally selected is shown in Fig. C. Diodes are used in the feedback path to switch in a resistor and lower the gain as the output amplitude Increases. This scheme will introduce some distortion because the amplifier gain is changing during every oscillation cycle. Only a slight gain change is needed, however, and the overall distortion at the oscillator output can be kept well below 1%. The final circuit design was optimized for the IC used and generates a sine wave having only 0.5% distortion. As a bonus, the unwanted energy is primarily in the third harmonic where it is relatively easy to filter out.

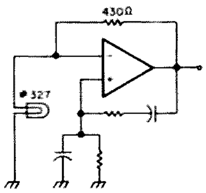


Fig. A.

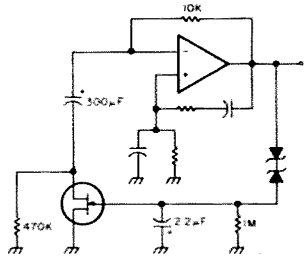


Fig. B.

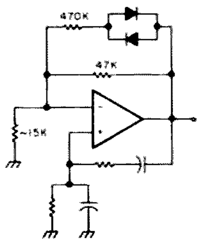
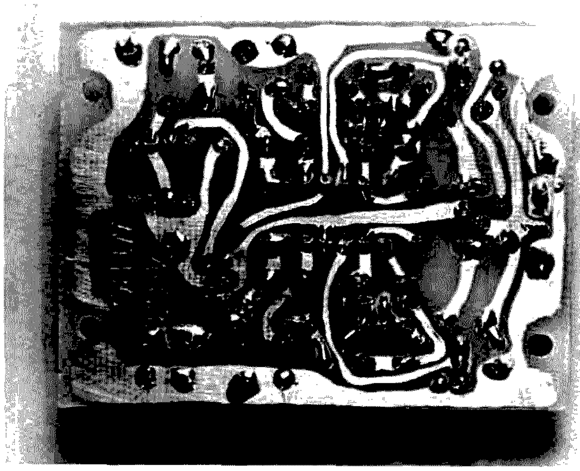


Fig. C.

ter's input jack. The stereo phone plug shown in the photographs fits many older pieces of gear (standard wiring; PTT line to tip, audio to ring, ground to sleeve), but newer equipment may require a different type of connector.

The two-section frequency-select switch turns the oscillators on and off and also introduces a gain of ½ between the active filters and output amplifier during two-tone operation. This attenuator prevents the peak audio output from doubling when both oscillators are on. That convenient feature makes it unnecessary to adjust the transmitter drive level when switching between single- and two-tone tests.

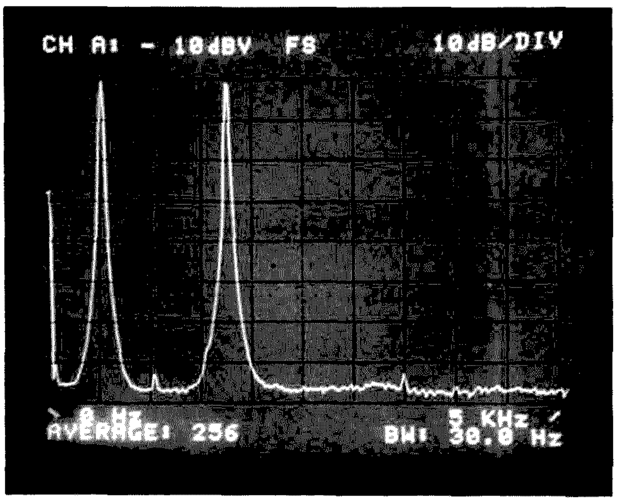
The power supply is a simple rectifier-filter followed by an LM723 regulator set to hold the output at 9 volts. Any dc output voltage from 8 to 20 will power the oscillator; the 9-volt level was chosen to make sure the circuit would work with a battery supply. Two LEDs are used as front-



My PC pattern was painted on using nail polish as resist material. While not as pretty as the photographic copy you can make from Fig. 2, it works just as well.

panel status indicators. One comes on with the dc power and the other lights when the PTT switch is in the transmit position. Wired in series to conserve current, the LEDs at 10 mA still draw 4 times the current needed by the rest of the circuit!

There are several reasons to consider using a battery instead of the ac supply. The transformer supply is convenient but bulky. My supply takes up more room than the rest of the circuit even though the transformer is smaller than any available from Radio Shack. Using the smaller 9-volt radio battery will definitely widen the choice of enclosures suitable for housing the tester. The battery will last a long time since the circuit only draws about 12.5 mA. If you do decide to build in an ac supply, try to get a shielded transformer like the one in the photographs. Failing that, be sure to mount the transformer further from the audio circuits than I did to keep 60-Hz hum off the audio signal.



Proof of the pudding! The two-tone output as seen on an HP 3582A spectrum analyzer. Horizontal scale reaches from dc to 5 kHz, and at 10 dB per vertical division, the largest spurs are 70 dB below the tone peaks. The "signal" at dc is generated inside the analyzer.

Another alternative is to build the ac supply with a surplus wall-mount transformer of the type used to power calculators. Even a 3- or 6-volt transformer could be used with a voltage-multiplying rectifier circuit. The LM723 regulator will work with any dc input between 12 and 40 volts, so a suitable transformer shouldn't be hard to find.

Parts

The audio circuits and PC board were carefully designed to use component values available from Radio Shack. Of course, a considerable savings can be realized by scrounging parts from old transistor radios. The capacitors in particular should be easy to locate. The four electrolytics on the PC board are quite common values but could be replaced with units having from 1 to 4 times the capacitance. The smaller capacitors used in the oscillators and filters must be the values specified but are still easy to find on old circuit boards. If you have a choice, stay away from ordinary ceramic capacitors since they're often not as stable as other types. The circuits are relatively insensitive to drift and the ceramic parts will work acceptably, but they should not be your first pick if something else is available.

The two trim resistors should probably be purchased since physical sizes vary widely and the PC layout is tailored to the Radio Shack parts. While not strictly necessary, the use of IC sockets is recommended as they greatly simplify amplifier replacement should the need arise. The switches can be of any size and type which fit the box used for the project.

Construction

The entire oscillator/amplifier portion of this project is built on the single 2" by 2.7" circuit board shown in the photographs and Fig. 2. The printed circuit makes it easy to pack a lot of components neatly into that small space. Point-to-point wiring on a slightly larger piece of prototype perfboard will work just as well if you're so inclined.

My power supply was built on another bit of PC board. That board also provides mounting space for the two indicator LEDs and the push-to-talk switch. The power supply has so few components that designing your own layout shouldn't be a problem. I haven't included the pattern for my board since you surely won't have the same size transformer or project case that I used.

The cabinet itself is the steel transformer housing from a discarded high-intensity lamp. Recycling old enclosures from unusual sources adds an extra bit of fun to home-brew projects and can provide some really custom-looking results as well. In this case, the old scratched-up paint was removed and replaced with a fresh coat of black wrinkle which was in turn oversprayed with light blue. Legend plates of a contrasting color add to the nice appearance, provide a flat surface for the transfer lettering, and also cover up the original holes.

If you want to use a commercially available box, Radio Shack sells several that are suitable. The choice is particularly wide if a battery is used instead of the larger ac-operated supply. Be careful not to buy a plastic box as the lack of rf shielding is an invitation to trouble.

The printed circuit board is a lot easier to make than you might think. If you have access to photographic

equipment, you can turn out a really professional board using the pattern of Fig. 2. Otherwise you can do what I did and get perfectly acceptable results using fingernail polish as resist material.

The pattern in Fig. 2 is full size and the holes are all on 0.1-inch centers. Drilling the holes is easy using a piece of 0.1-inch-spaced perfboard as a template. Cut out the pattern (or a Xerox® copy of it) and carefully glue it onto a piece of perfboard so the holes in the PC pattern align with those in the board.

Now cut out an unetched blank of PC board and clamp the drilling template to the copper side. Drill the four mounting holes first. I used a #33 drill for 4-40 screw clearance; a #28 drill is the one to use for 6-28 hardware if you prefer that size. Loosen the clamps and bolt the boards together using those four holes.

Now you're all set to drill the 122 component holes. A #60 drill is necessary for this and a drill press helps a great deal. The holes in the perfboard force you to drill in the right place; when the boards are unbolted, there'll be an impressively neat array of properly-spaced holes. Sand the copper lightly to remove any rough edges and you're all set to apply the resist pattern.

The pattern of printed circuit runs is simply painted onto the copper surface with nail polish using Fig. 2 and the drilled holes in the board as a guide. Choose a bright red color so the resist will be easy to see against the copper surface. Applying the nail polish with the brush attached to the lid of the jar is easier once about 2/3 of the bristles have been trimmed away with a sharp pair of scissors. Small mistakes with the polish can be scraped off with a pointed knife blade. Really big mistakes can be corrected by cleaning off the entire board with nail-polish remover or a solvent like acetone. *Acetone is serious stuff, so use good ventilation, avoid excess skin contact, and don't work near open flames!*

After the resist is applied, the board can be processed using any of the standard techniques described in the *ARRL Handbook* and elsewhere. Check your work for stray resist material joining runs before dropping it into the bath. When it's done, wash the board with water and examine it for any traces of unetched copper before removing the resist. As a final step after cleaning off the nail polish, run over the board with fine sandpaper or a pencil eraser to brighten up the copper in preparation for soldering.

Mounting the components takes just a few minutes once the PC board is ready. The holes for the two trimpots will have to be drilled out slightly to receive the mounting pins, and that should be done before anything is soldered down. Placement of the various parts is shown in Fig. 3 and the photographs, but if there is any question, the PC patterns can always be checked against the schematic.

The PC pattern in Fig. 2 does not exactly match the board in the photographs. In my unit, the 100-Ohm resistor in series with the 741 output is mounted on the output-level switch. Without that resistor, the 741 oscillates at 2 MHz when the controls are set for maximum output. That happens because the .005-uF bypass capacitor is then effectively connected directly across the op-amp output and it loads the output stage at high frequencies. The problem wasn't noted until after my board was etched, but the resistor cure is included in the Fig. 2 layout.

Parts List

*Items so marked are used in the power supply and may be deleted if power is obtained from a 9-V battery. Suitable components are available from Radio Shack and elsewhere. Several parts are identified with Radio Shack part numbers to better describe the components needed.

Resistors

Value	**# Needed**	
* 33 Ohms	1	
100 Ohms	2	
270 Ohms	3	
* 1.8k	1	
* 6.8k	1	
15k	9	
22k	5	
33k	5	
47k	2	
470k	2	
10k trimpot	2	RS #217-335
5k pot + switch	1	RS #271-214
Capacitors		
* 100 pF	1	
.001 uF	1	
.005 uF	4	
.01 uF	2	
.022 uF	2	
.1 uF	1	
2.2 uF, 16 V	3	
33 uF, 16 V	1	
* 220 uF, 35 V	1	

Semiconductors

- * LM723 voltage regulator
- LM324 quad op amp
- 741 op amp
- * 100 PIV, 1 Amp or more bridge rectifier RS #276-1171
- LEDs (2 required)
- 1N914 small signal diodes (4 required)

Miscellaneous

- * Power transformer
- DPDT (center-off) toggle switch RS #275-1545
- SPST switch
- IC sockets
- PC or prototype board
- Cabinet
- Mike plug
- * Line cord

Checkout

The board should be checked before final assembly into the cabinet. Temporarily solder on the switches with short lengths of wire and connect a scope or ac voltmeter to the output terminal. Hook a 9-volt supply to the power-input pad and ground and verify that the circuit draws about 2.5 mA. Now set the output attenuator to the high range (22k resistor shorted), flip the mode switch to the 500-Hz position, and adjust RT1 until the output level is exactly 1 volt rms (2.8 volts p-p on the scope). Then switch the mode switch to the 1750 position and adjust RT2 to give the same reading. When both tones are on, the output will read 0.7 rms, but the peak-to-peak level will still be 2.8 volts.

If the circuit doesn't work straight away, check the mode-switch wiring and the amplifier dc output levels. It's unlikely that you made a major PC board error, but solder splashes or stray whiskers of unetched copper are always a possi-

bility. Several strategic voltage levels are shown on the schematic for help in troubleshooting. The ac levels will change with trimpot settings and in any case must be measured with an ac-coupled voltmeter. The ac-voltage ranges of most VOMs will respond to either ac or dc voltages. That problem is easily cured by placing a 2-to-30-uF capacitor in series with the meter. The dc voltages noticed should be independent of switch or trimpot settings, as the dc bias on the amplifiers is determined only by the power-supply level.

Putting It All Together

One disadvantage of working with high-purity signals is that they are so easily corrupted by poor assembly practices. Hum levels unobjectionable in other applications can significantly compromise the quality so carefully designed into this circuit. Because of that, there are several things to watch out for when the board is mounted into its metal enclosure. The power transformer, especially if it doesn't come completely encased in a metal shield, will be surrounded by 60-Hz magnetic fields. Keep it as far as possible—preferably 2 or 3 inches—from the oscillator circuit board. Arrange things so the various control leads leaving the board are short, direct, and away from the transformer and ac wiring.

One particular problem is hum coupled from the ac switch leads running to the back of the output potentiometer. Use relatively small wires for this purpose, tightly twisted to provide a measure of magnetic shielding. Notice in the photograph that those wires approach the potentiometer from the back while the audio connects to the front. The ac leads are also dressed perpendicularly to the circuit board instead of running alongside it.

Despite these precautions, the wires in my unit couple a small 60-Hz signal into the channel occupying one side of the circuit board. The hum is 70 dB below the oscillator tone and could probably be reduced further by electrically shielding the wires with some braid taken from a short length of RG-58. I didn't bother because the hum is no larger than some of the other spurious signals and few sideband rigs will respond to inputs at 60-Hz in any case. I had the means to measure that hum, however, and you may not, so take some extra care when positioning things in your box.

The metal case is connected to the circuit ground at only a single point: the hole where the shielded microphone cable leaves the box. This single-point grounding eliminates some potential sources of noise by separating signal currents from whatever noise currents might be flowing in the shield wall.

Test equipment is often seen as a corner that's all too easy to cut. Perhaps infrequently used, often expensive, usually bulky, it's just easier to put up with antiquated gear or do without altogether. The older equipment, while better than nothing, is often basically unsuited to an amateur's needs. You'll find this two-tone tester, even if you only use it once or twice a year, a convenient gadget well worth having. Small and inexpensive, yet reliable and easy to use, it's a good solution to several transmitter testing problems. The high-quality output also will put an end to any nagging concerns about the purity of the audio you've been getting from that old patched-up kit oscillator! ■

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Yaesu, Icom Graft Revealed

Splice Icom's headset to Yaesu's talkie and discover handie happiness.

One of Icom's accessories for their VHF handie-talkies is the HS-10 headset and its accompanying HS-10SB switch box. Priced at just under $40.00, this headset with its attached boom mike is perfect for mobile use with a handie-talkie. Instead of holding the heavy transceiver up to your mouth to talk and up to your ear to hear, you simply slip the headset over your head and ham it up in comfort. The HS-10SB switch box is a necessary companion to the headset since it contains a small mike preamplifier (which boosts the audio so you don't have to talk directly into the boom mike) and a push-to-talk (PTT) switch which has both momentary-on and locked-on positions.

As soon as I saw this handy device, I decided that I had to make it work with my Yaesu FT-208R transceiver. This article describes the modifications needed to make it work.

The modifications consist of two parts: Cut off the Icom mike connector and substitute a Yaesu connector, and make a few minor changes to the HS-10SB switch box.

Fig. 1 shows the diagram of the original switch box. The mike signal is applied to a 2k volume control, and its output is then amplified by a one-transistor amplifier. The output is then sent, through the PTT switch, to the transceiver through the white wire in the coiled cord. The white wire actually serves three purposes:

(1) It carries amplified mike audio to the transceiver.

(2) It provides several volts of dc to the mike amplifier when the PTT switch is closed. This voltage provides the Vcc (collector supply voltage), base bias, and also a bias to the electret mike itself (through the 2k volume control).

(3) It also keys the transceiver when the PTT switch is closed.

Speaker output coming in on the red wire is sent to the earphone in the headset through a 33-Ohm resistor to slightly reduce the volume level. In addition, a 10-Ohm resistor provides the load for the transceiver's audio amplifier.

Finally, ground is connected through the shield in the coiled cable as well as through the blue wire.

The PTT circuit in the Icom combines mike audio, PTT, and Vcc voltage on one wire. The transceiver's battery connects to the white wire through a resistor. When the PTT switch is closed, the transceiver detects the slight voltage drop across that resistor and keys the transmitter. At the same time, this resistor also supplies the required voltage for the amplifier and electret mike.

The mike interface in the Yaesu FT-208R is completely different. It uses a six-pin mike connector which provides separate pins for audio in, PTT, and Vcc for a mike amplifier or for mike bias. An advantage of this scheme is that the Yaesu dis-

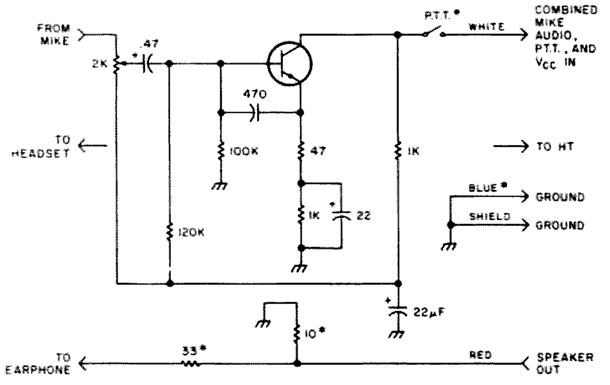

Fig. 1. The original circuit of the Icom switch box. Asterisks show components to be removed or rewired—see text

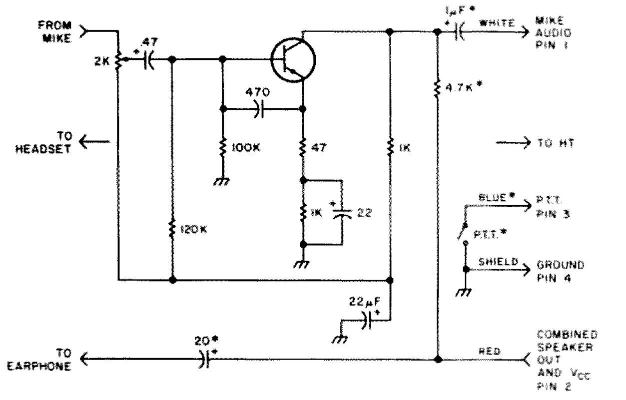

Fig. 2. Modified Icom switch box for use with Yaesu FT-208R. Asterisks show new or rewired components.

ables the built-in mike on the handie-talkie when the remote-mike PTT switch is closed. In addition, the speaker output from the Yaesu radio carries a dc voltage, which requires a slightly different earphone circuit as well.

Fig. 2 shows the modified circuit of the switch box (asterisks in Figs. 1 and 2 identify those components which have to be changed or added).

In Fig. 2, a 1-uF capacitor is used to isolate the amplifier output from the white wire. This prevents dc voltage from being fed back into the transceiver's mike circuit. Likewise, a 20-uF capacitor couples speaker audio from the transceiver to the earphone and prevents dc from getting to the earphone. Both capacitors are electrolytics or tantalums, and polarity must be as shown in the diagram.

A 4.7k, 1/4-Watt resistor is added to provide the required dc voltage for the amplifier and mike circuit. Although the Yaesu has a separate dc output on its connector, that output cannot be used because it would require one more wire in the coiled cable. Since the cable only has three leads plus a shield, I chose to get the dc voltage from the speaker output.

Finally, the PTT switch is wired directly between the PTT pin and ground.

All of the added components and wires fit neatly into the HS-10SB switch box as long as you use very small capacitors and are careful about component placement. There are several obstructions in the case, and you may have to bend the leads in several places to allow the case to close. As shown in Fig. 2, the original Icom cable is also used, although the blue wire has to be unsoldered from the ground connection and reused for its new purpose.

On the transceiver end, you will have to cut off the original Icom connector and substitute the required Yaesu connector. I obtained mine by calling Yaesu (see their ad in this issue). Although the connector is tiny and requires care in soldering, it was not particularly difficult. It has six pins, though only pins 1 through 4 are actually used in this modification. Fig. 3 shows the pin layout of that connector on the FT-208R, but note—it is possible that the orientation of the connector on your rig may be different from that on mine. Use an ohmmeter to identify pin 4, the ground pin, before you start to work.

I took one shortcut in this design that you should be aware of. In the original Icom design, power is applied to the microphone circuit only when the PTT switch is closed during transmitting, whereas my circuit applies power during receiving as well. This introduces an extra battery load of slightly over 1 milliampere. I decided that this was not important and let it go. But if you feel strongly enough about it, there is a way out. The PTT switch in the switch box is a DPDT switch, with the two sections paralleled. By disconnecting one section of the switch and placing it in series with the new 4.7k resistor, you can ensure that the mike amplifier is powered only when the PTT switch is pressed. ■

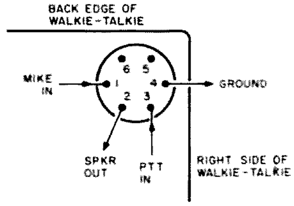

Fig. 3. Yaesu microphone connector pin layout.

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Stare-Way to Heaven

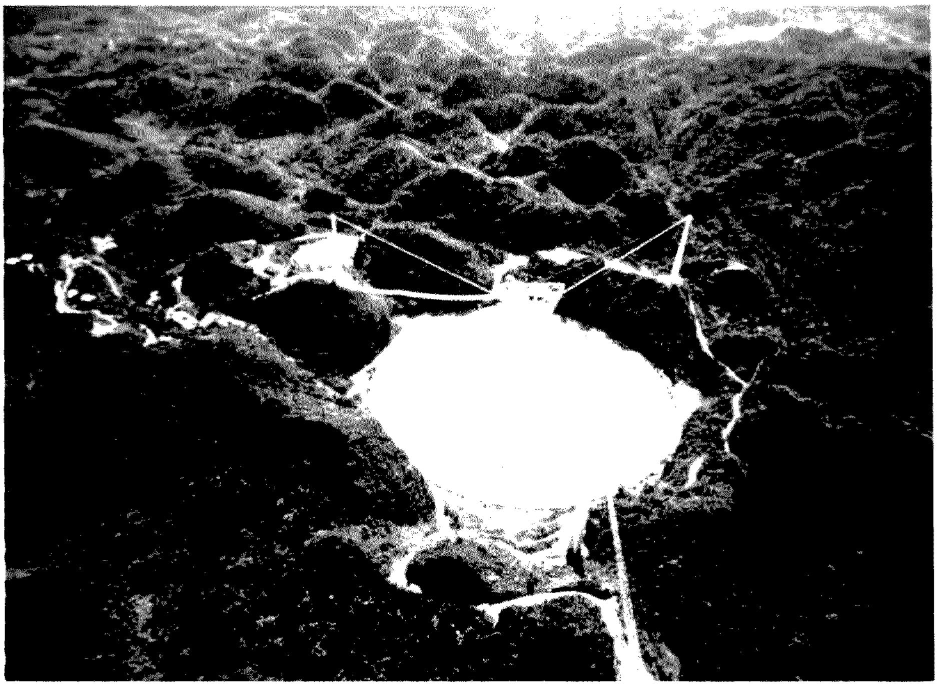
At the Arecibo observatory, the sky's the limit. Who said size doesn't matter?

The Arecibo observatory on Puerto Rico holds several records in the field of radio. Its antenna, with a diameter of 1000 feet, is the largest antenna in the world. The 450-kW output of the S-band (2.400 MHz) transmitter together with the gain of the antenna, which at this frequency is estimated to be 72 dB, make the signals from Arecibo the strongest signals to leave Earth. Although higher resolution can be achieved by other radio telescopes by coupling two or more of these together, the Arecibo observatory still has the highest sensitivity to weak signals from space.

The observatory is located about 6 miles from the port city of Arecibo, near the north coast of Puerto Rico. The landscape around the observatory is very beautiful and scenic, consisting mainly of limestone hills and valleys covered with lush tropical vegetation.

The 1000-foot reflecting antenna makes the Arecibo observatory a very conspicuous landmark when seen from the air. The reflecting dish was constructed in a natural limestone sinkhole, the shape of which was such that only small excavations were necessary to make room for the huge reflector. The surrounding limestone hills are helpful in shielding the observatory from man-made radio noise. The isolated location of the facility adds to this protection.

The reflector at the Arecibo observatory is mounted firmly in the ground, in contrast to other radio telescopes which search the sky by moving the entire antenna dish. Radio telescopes are usually constructed with a parabolic reflecting dish, but in order to be able to search the sky without moving the entire reflecting dish, a different shape had to be chosen for the Arecibo reflector. It has, therefore, been shaped like a section of a perfect sphere. With this construction, the observatory can be steered by moving secondary antennas which are receiving the signals that are being reflected from the dish. These secondary antennas are mounted on a triangular platform about 450 feet above the reflecting dish. The platform is suspended by steel cables from three towers that have been built around the edge of the reflector.



The 1000-foot reflecting dish at Arecibo was built in a natural limestone sinkhole.

Radio telescopes with parabolic reflectors have a point-like focus. The secondary antenna or feedhorn which receives the signals from parabolic reflectors has to be mounted at the focal point in front of the dish. But the focus of the Arecibo observatory, with its spherical reflector, is along a line above the reflecting dish. The secondary antennas, therefore, have to be suspended above the reflector and must be able to pick up signals along that line.

The position of the platform and the secondary antennas must remain very stable, even in strong winds. The necessary stability has been accomplished through a great deal of sophisticated engineering. The platform is triangular, and its weight is 600 tons. A circular track, 130 feet in diameter, has been mounted under the platform. The feed arm is a structure which can rotate under these tracks. The feed-arm structure itself has a pair of tracks on its underside. These tracks are curved, so that all points along these tracks are an equal distance from the reflecting dish underneath. The secondary antennas are mounted on two carriages which can move along the tracks under the feed-arm structure. These two carriages will normally be positioned in such a way that they counterbalance each other.

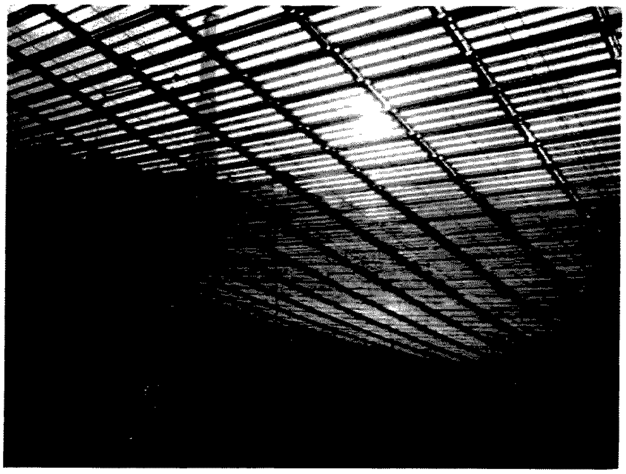
The antenna dish consists of almost 39,000 aluminum panels. These panels are perforated so that about 44 percent of the sunlight can reach the ground underneath the dish. The sunlight which passes through the dish allows vegetation to grow underneath. Without this vegetation, rainfalls would cause severe erosion of the landscape underneath the platform.

A square of laser-reflecting material has been mounted on each aluminum panel. A laser system can check the shape of the reflecting dish by bouncing light off each of these squares. A computer is then able to calculate the position of each panel to within 1/8 of an inch. The position of each panel can be accurately adjusted from underneath, and this is done whenever a sufficiently large deviation from the ideal shape of the dish has been detected.

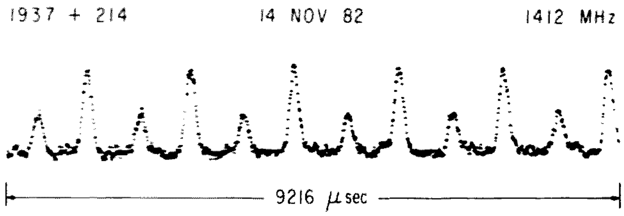
A laser system is also used to maintain the position of the platform within very narrow tolerances. A laser reflector is mounted at each of the three corners of the platform. Whenever a computer detects a significant change in the position of the platform through this system, it can regulate the tension on tie-down wires that are connected to each corner of the platform. By controlling the tension of these wires, any change in the position of the platform can be neutralized.

The radio telescope receivers are mounted inside the carriages that suspend the secondary antennas. All electronic components generate small amounts of electrical noise which is proportional to the temperature of the components. If the receivers were to work at room temperature, the internal noise would be stronger than most of the weak signals which the observatory is receiving from space. For this reason, the front end of the receivers is cooled by a refrigeration system using liquid helium. The boiling point of liquid helium is 4.2° Kelvin, and at this temperature the receivers are capable of detecting extremely weak signals from space.

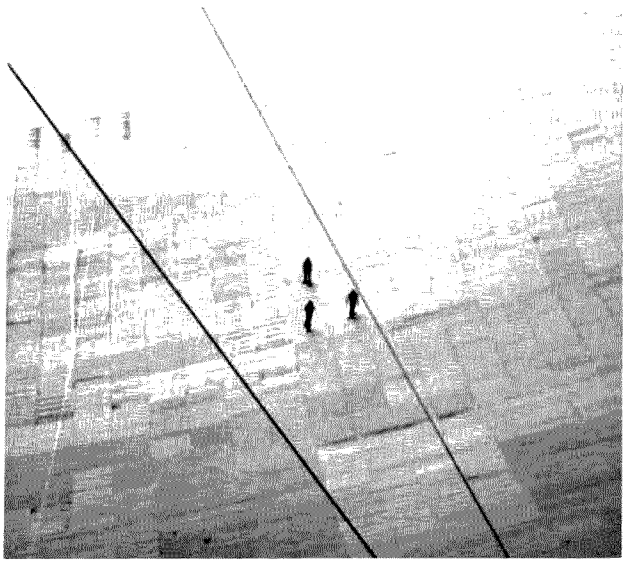
The transmitters at the Arecibo observatory are being used for ionospheric research and radar studies of the solar system. These transmitters also are mounted in the carriages in order to



The aluminum panels are perforated so that much of the sunlight can pass through. Vegetation can therefore grow under the reflecting dish, preventing erosion of the landscape.



Printout of the signal from the very fast pulsar, 4C21.53, as this was detected at the Arecibo observatory on November 14, 1982. This pulsar rotates 642 times each second and transmits one of the larger and one of the smaller pulses during each rotation.



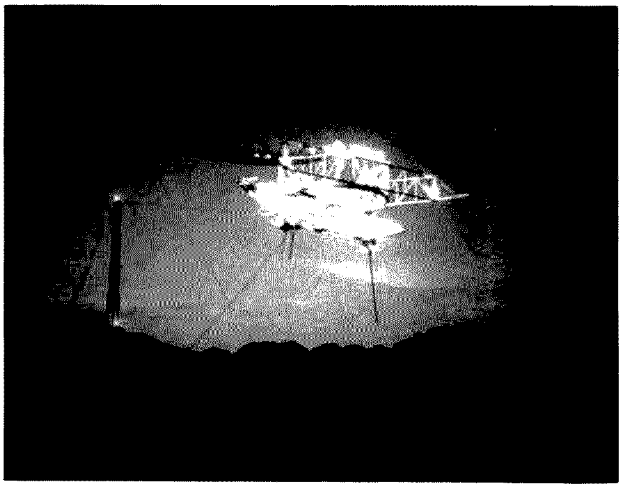
Workmen on the reflecting dish are using shoes which distribute their weight over a large area, like snowshoes. Walking on the reflecting dish is now being avoided, and almost all adjustments and repairs are being done from the underside.

The platform structure weighs 600 tons. Most of the antennas which receive the signals that are reflected from the reflecting dish are mounted on two carriages which can move along the curved track on the underside of the platform.

minimize losses in the transmission line. If coaxial transmission lines were to be used to carry the output from transmitters on the ground to the platform, the losses would be substantial at the high frequencies that are being used.

The power supply is often the heaviest part of a radio transmitter. Therefore, the power supplies for the transmitters are mounted in buildings at the edge of the reflector. Thick dc cables carry the voltages from these power supplies to the transmitters under the platform. When the radar transmitters are being used, a great deal of waste heat must be dissipated from the transmitting tubes. In order to cool these effectively, water circulates through them. Water hoses connect the transmitters with the water supply on the ground.

The observatory has been built so that a single observer can control the entire facility. The observer can steer the carriages under the platform with extreme accuracy from computers in the control room. These can therefore counter the rotation of Earth with a very high degree of exactness.



The Arecibo observatory at sunset.

All signals that are received at the Arecibo observatory are processed by computers in the control building. The frequency of the received signals can be determined to a fraction of a cycle even at microwave frequencies. Doppler shifts and emission lines in the signals from space can thus be determined. The time of arrival at the antenna for received radio signals can also be measured with an extreme accuracy.

The Arecibo observatory can at any time study a circular area of the sky about 40 degrees in diameter. This area is centered at local zenith. Due to the rotation of Earth, about 39 percent of the sky is available for observation from the Arecibo observatory. Unlike optical observatories, radio telescopes can observe the sky in daylight and during cloudy conditions. Only during strong electrical storms may a radio telescope be unable to observe.

Radar astronomy has recently contributed much to our knowledge of objects in the solar system. This technique detects the reflection of man-made signals from objects in space. The Arecibo observatory is our most sensitive radar-astronomy instrument. Through radar observations from Arecibo, the rotation period of Venus was determined for the first time. It also was determined that Venus rotates in the opposite direction of other planets. Radar maps of Venus have been produced through radar observations from Arecibo. Radar observations have also been made of the rings of Saturn, the asteroid belt, and the planet Mars.

In mankind's first deliberate attempt to announce itself to other civilizations, the enormous output power of the Arecibo radar transmitter at 2.400 MHz was used. A message was beamed to several segments of the sky in 1974. The message was coded in a binary code and contained information about mankind, Earth, and the solar system.

The first quasar was discovered by the Arecibo observatory in 1964. These remarkable objects, which are believed to be located at the center of extremely distant galaxies, emit enormous amounts of radio waves and other types of electromagnetic waves.

Pulsars are objects that emit radio waves that turn on and off rapidly. These are believed to be rapidly-rotating neutron stars that emit radio waves from the magnetic poles. Each time a rotating magnetic pole sweeps past Earth, another pulse can be detected at Arecibo. Although the first pulsar was found by an English radio telescope, many of the numerous pulsars that since have been detected were found first by the Arecibo observatory.

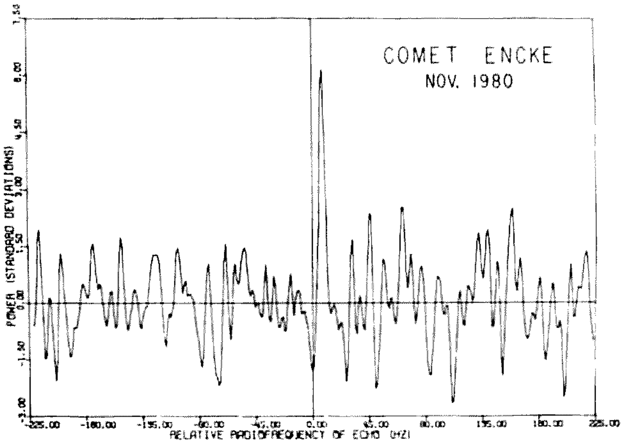
Galaxies are not distributed evenly throughout the universe but seem to be concentrated in clusters, superclusters, and huge filaments in space. In between there are huge voids with few or no galaxies. The Arecibo observatory has devoted much of its observing time to the mapping of galaxies and systems of galaxies.

The Arecibo observatory, together with other radio observatories, has been able to identify a number of molecules in the space between stars in the Milky Way. Clouds of interstellar molecules are believed to play an important role in the birth of new stars. Much of the observing time at the Arecibo observatory is therefore also being devoted to the mapping of molecular clouds in space.

The US Congress has decided recently to fund a program which will search for radio signals from other civilizations in our galaxy. This program, which is being

managed by the National Aeronautics and Space Administration, will cost two million dollars each year. A number of radio telescopes will be used in this program, including the Arecibo observatory. In the next few years, between five and ten percent of the observing time at Arecibo will be used in the search of signals from other civilizations.

During their journey out into space, the two *Voyager* space probes are making continuous observations of cosmic rays, magnetic fields, and the solar wind. As the most sensitive radio-receiving instrument on Earth, the Arecibo observatory will be able to receive signals from these space probes long after they have become too faint for other radio telescopes. If no malfunction occurs in the radio transmitters aboard these space probes, their signals should be detectable at the Arecibo observatory for at least 30 more years.



Radar echoes from the nucleus of the comet Encke were detected by the Arecibo observatory in November, 1980. This is the first detection of the nucleus of a comet. The strength of the received echo indicates that the nucleus has a diameter of about 2 miles. The rotation and speed of the nucleus can be determined from the Doppler shifts in the echo.

The Arecibo observatory, which was completed in 1963, is being operated by the National Astronomy and Ionosphere Center at Cornell University. About 100 persons are employed at the observatory in Arecibo, and another 40 persons are working at Cornell University's Astronomy Center in Ithaca, New York. Observing time at the observatory is available to astronomers from all countries.

The Arecibo observatory is being improved constantly as new equipment and technologies become available. The observatory has contributed much to our knowledge and understanding of the universe during the past 20 years. It is likely that the Arecibo telescope will remain one of mankind's most sensitive and versatile astronomical observatories for many years to come. ■

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Counter-Productive Basics: Part I

Digital needn't be difficult. Let K4IPV guide you through the fundamentals of frequency counting.

Digital frequency counters have long been a favorite means of measuring the frequency of operation of radio transmitters, but until recently their cost has been prohibitive for amateurs. Until about a decade ago, only the wealthiest shops and laboratories could afford a counter. Most commercial service shops of that era used heterodyne frequency meters, not counters.

In the early seventies, however, costs started falling. The 5-kilobuck 500-MHz counter dropped in cost to about 2 kilobucks. During that same period, the first amateur-grade counters were on the market. Heathkit™ offered their IB-101. That counter sold for around $200 in kit form and operated to 15 MHz (my sample actually worked well to 23 MHz). Today, amateur-grade counters can be bought for less than $100 and operate to frequencies up near 600 MHz.

The photographs show three different models which represent the types used by amateurs. The Heath IM-2410 (Photo A) operates on frequencies up to 225 MHz. This is a basic counter with the minimum features needed. The Heath IM-2400 shown in Photo B is also a basic counter but is hand-held and portable. The IM-4110 shown in Photo C is more than a basic counter; it contains a number of interesting features. It is a frequency counter (to 110 MHz) and also will measure events and period. The period-measurement function also measures period average, which is the period measured over 10 seconds.

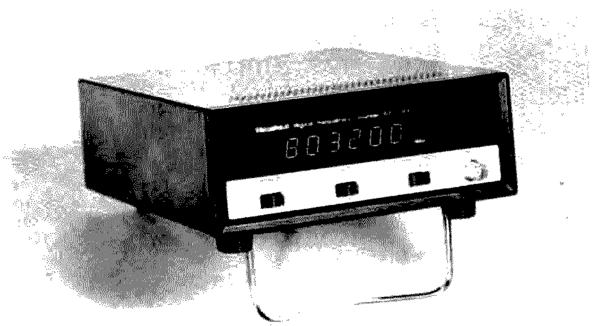
Photo A. The Heathkit IM-2410 portable frequency counter.

The advances in digital electronics over the past decade coupled with rapidly falling IC prices have made amateur use of counters possible. Even though counters are low cost now, they are not foolproof. There are problems in operation that cause erroneous readings—or no readings at all.

In this part of my two-part series, I will discuss the basic theory behind digital counters. In part II, I will discuss some of the nuances of digital frequency-counter (DFC) operation.

Digital Counter Basics

A single article cannot fully discuss enough digital electronics unless a few assumptions are made. For those who want more detailed treatment, I recommend my digital electronic series in *73* for September through November, 1982. In this article, I will reiterate only a small amount of the digital-basics series.

A flip-flop (F-F) is essentially a 1-bit memory element. There are several different types of flip-flops, but the type which concerns us here is the J-K flip-flop shown in Fig. 1(a). There are two complementary outputs on the F-F, labelled Q and $\overline{Q}$ (i.e., "not-Q"). Since these outputs are complementary, one will be HIGH when the other is LOW; these outputs will never be at the same level.

There are five inputs on the J-K F-F. These inputs are: J, K, clock, set, and clear. The J and K inputs are essentially control inputs; their use will be explained shortly. The clock input synchronizes the F-F operation and usually has a square wave applied. The set input is

used to force the F-F to the state where Q = HIGH and $\overline{Q}$ = LOW. Clear is just the opposite; it forces the outputs to the state where Q = LOW and $\overline{Q}$ = HIGH. The usual circuit symbol is that of Fig. 1(a). This example, incidentally, uses active-LOW set and clear inputs, which is the usual case in TTL devices. We do, however, sometimes see active-HIGH inputs.

Fig. 1(b) shows the truth table for the unclocked (or direct mode) operation. In this mode, the J-K F-F doesn't care what the signals at the clock or J-K inputs are doing. Only the set and clear inputs are used. Since our example uses active-LOW inputs, the state in which both set and clear are LOW is disallowed. In that case, the poor flip-flop won't know what to do. If the set is made LOW, the Q output goes HIGH and not-Q goes LOW. If set is HIGH, and clear is LOW, we see exactly the opposite situation: Q is LOW and not-Q is HIGH. If both set and clear are HIGH, then the F-F will be in the clocked mode of operation.

The truth table for clocked operation of the J-K flip-flop is shown in Fig. 1(c). The clock synchronizes the operation of the J-K F-F; all action takes place on the negative-going (i.e., HIGH-to-LOW) transition of the clock signal. In all cases of clocked operation, the set and clear inputs must remain HIGH. The programming of the F-F takes place on the J and K inputs.

If both J and K are LOW, then there will be no change on the Q and not-Q outputs regardless of clock-input transitions. In this condition, the J-K F-F is locked.

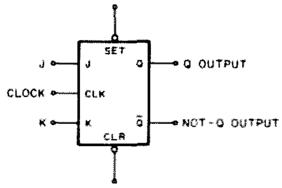

Fig. 1(a). A J-K flip-flop.

If J is LOW and K is HIGH, the Q output will be LOW and not-Q is HIGH. Action takes place on the negative transition of the clock line.

If J is HIGH and K is LOW, then the Q goes HIGH and not-Q is LOW. As in the previous case, the transition occurs on the negative transition of the clock line.

If both J and K are HIGH, then the outputs will go to the opposite state. If, for example, Q = HIGH, then on the negative transition of the clock line the Q output will go LOW. Similarly, if Q had been LOW, the clock transition would have made it go HIGH. This is the condition used in digital-counter circuits and results in binary frequency division.

Fig. 2(a) shows a two-stage binary divider based on J-K flip-flops, while Fig. 2(b) shows the timing waveforms. Note that on both flip-flops the J and K inputs are tied HIGH. The outputs are Q of F-F 1 (i.e., Q1), and Q of F-F 2 (i.e., Q2). The input signal is applied to the clock of F-F 1, while the clock of F-F 2 uses the Q1 signal as its input.

In the timing diagram, the negative-going transitions are labelled T1, T2, T3, and T4. At time T1, the input signal makes a negative transition, so Q1 snaps HIGH; Q2 remains LOW. The Q1 output remains HIGH until the next negative-going transition of the input signal, at time T2. At this time, the clock input of F-F 2 sees Q1 drop LOW, so it will cause Q2 to snap HIGH. At time T3, another input negative-going transition occurs, so Q1 goes HIGH again; it will remain HIGH until the next negative-going transition at time T4. At T4, both the clock inputs of F-F 1 and F-F 2 see negative-going transitions, so both Q1 and Q2 go LOW.

J	K	SET	CLEAR	CLOCK	Q	$\overline{Q}$
x	x	0	0	x	DISALLOWED	
x	x	0	1	x	1	0
x	x	1	0	x	0	1
x	x	1	1	x	NORMAL CLOCKED OPERATION	

NOTE: 1 = HIGH
0 = LOW
x = DOESN'T CARE

Fig. 1(b). Truth table for the unclocked mode of operation.

J	K	SET	CLEAR	CLOCK	Q	$\overline{Q}$
0	0	1	1		NO CHANGE	
0	1	1	1		0	1
1	0	1	1		1	0
1	1	1	1		GOES TO OPPOSITE	

NOTE: 1 = HIGH
0 = LOW
x = DOESN'T CARE

Fig. 1(c). Truth table for the clocked mode of operation.

Note what has happened in Figs. 2(a) and 2(b). There are four input pulses, yet Q1 produced only two output pulses; F-F 1 acted as a binary divider (i.e., divide-by-2). Similarly, the input of F-F 2 sees the two pulses at Q1 and produces one output pulse; F-F 2 also acted as a binary divider. Thus, the output of F-F 2 is one-fourth the input frequency. In a cascade chain of J-K F-Fs the binary division will be 1 (i.e., the input frequency), 2, 4, 8, 16, 32, and so forth.

A decade counter is a divide-by-10 (i.e., base-10) counter. Such a counter circuit is needed in decimal-counting systems used in our digital frequency counters. Unfortunately, there is no 10 in the 2, 4, 8, 16 sequence of a four-stage binary counter. We can, however, make a decade counter from a four-stage binary (i.e., base-16) counter by causing it to reset to 0000 after the tenth input pulse. Such a circuit is shown in Fig. 3(a), while its timing is shown in Fig. 3(b).

The decade counter is a base-16 binary counter modified by the addition of a NAND gate (G1). The timing diagram shows the circuit action. The output of G1 is

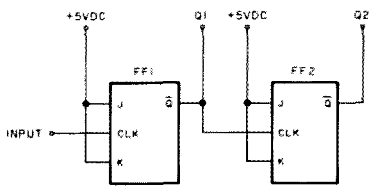

Fig. 2(a). Two-stage binary divider based on J-K flip-flops.

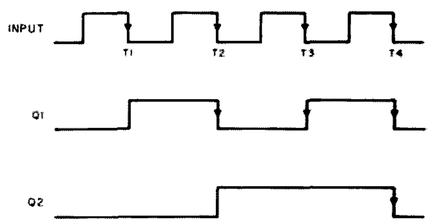

Fig. 2(b). Timing waveforms for Fig. 2(a).

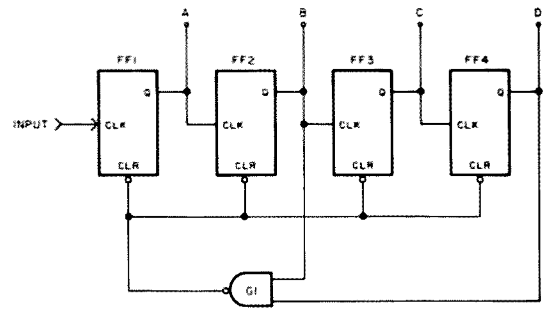

Fig. 3(a). Four-stage binary-counter circuit.

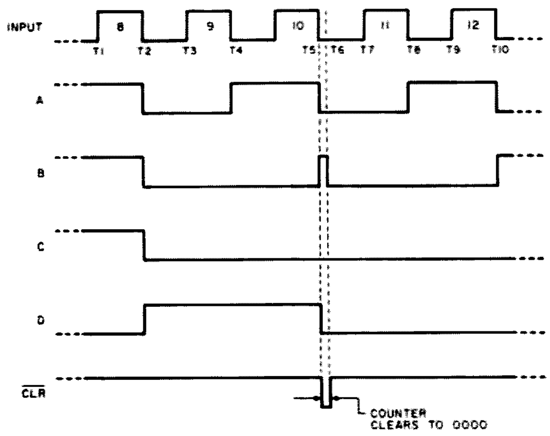

Fig. 3(b). Timing waveforms for Fig. 3(a).

connected to a common clear line. When this line drops LOW, the outputs of the counter go to 0000_2. The inputs of G1 are connected to the B (i.e., Q2) and D (i.e., Q4) flip-flop outputs. If B and D go HIGH simultaneously, then the output of G1 goes LOW and all four flip-flops will be reset. The only time these conditions are met is at T5—see Fig. 3(b). Following T5, the counter is 0000_2 and begins all over again.

The A, B, C, and D outputs form a four-bit binary-coded decimal (BCD) "word" that denotes the ten digits of the decimal numbers system. This code results in ten unique binary codes. These BCD codes are shown below:

D	C	B	A	Decimal
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9

There are a number of IC digital counters on the market. One of the oldest is the 7490 TTL device. The 7490 is a biquinary counter, i.e., it contains one divide-by-2 counter stage and one divide-by-5 counter stage. When the output of the binary stage is connected to the input of the quinary stage (i.e., pins 1 and 12 are shorted together), the 7490 becomes the decade counter of Fig. 3(a).

Most modem frequency counters made today do not use the 7490 but rather will use MSI or LSI multi-stage counters. We will, however, use the old-fashioned 7490 device here to illustrate a principle that would be lost in the maze of an MSI device. Fig. 4 shows a decimal counting unit (DCU) based on the 7490 and certain companion chips, the 7475 quad-latch, and 7447 BCD-to-seven-segment decoder.

A DCU will count by tens and produce a decimal output. In the case of Fig. 4, the display device is the familiar seven-segment LED decimal display. This form of display uses seven lighted bars (designated a, b, c, d, e, f, and g) to represent the ten digits of the decimal system.

The 7447 receives a BCD 4-bit word at its inputs and causes the appropriate outputs (a–g) to drop LOW. When an output is LOW, the corresponding segments of the display turn on. Besides the BCD inputs, there are also a test input, a ripple blanking input (RBI), and a ripple blanking output (RBO).

The test input is sometimes called $\overline{LT}$, for "lamp test." When the test input is brought LOW, all 7447 outputs go LOW. This situation forces the seven-segment display to show an 8. This input allows us to test the display decoder device.

The RBI and RBO terminals are for ripple blanking, i.e., the suppression of leading zeros. Let's consider a

Photo B. The Heathkit IM-2400 hand-held frequency counter.

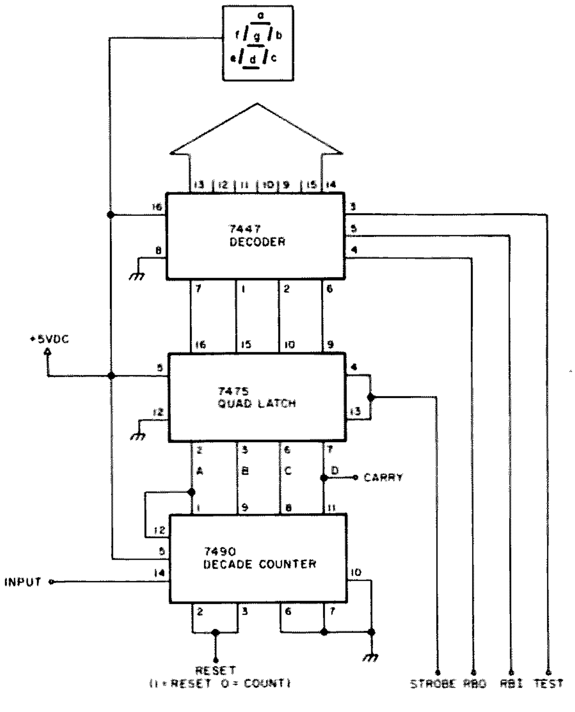

Fig. 4. A decimal counting unit.

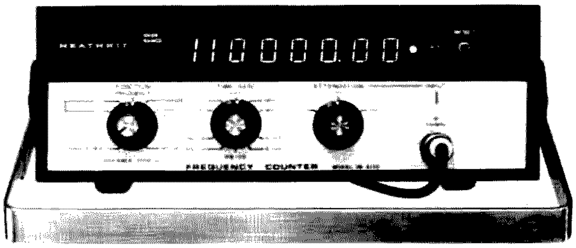

Photo C. The Heathkit IM-4110 frequency counter.

situation. Suppose our eight-decade counter measures a frequency of 21390 kHz. Without ripple blanking, the reading would be "00021390." If we provide blanking, however, we can turn off those leading zeros and display 21390. If a LOW is placed on RBI, the display will turn off if the applied BCD word is 0000_2. The RBO output goes LOW if the BCD input is 0000_2. Thus, by daisy-chaining the RBO outputs to the next least-significant RBI inputs, the leading zeros are suppressed.

The 7475 is quad-latch, i.e., a four-bit memory. Inside the 7475 are four type-D flip-flops. These F-Fs are arranged in two groups of two each. Each group of two has a common clock line. In Fig. 4, the clock lines are tied together to form a common strobe line. When this line is made HIGH, the BCD word at the 7475 inputs is transferred to the outputs. Thus, we can use the strobe line to update the display only after the decade counter has finished counting.

A decimal counting assembly (DCA) is made by cascading two or more DCUs. The D output of less significant DCUs is connected to the input terminal of the next significant DCU. We require one DCU in the DCA for each decimal digit of the DCA.

Frequency Counters

A digital frequency counter measures events per unit of time (EPUT) to form a DFC; we arrange a DCA so that input pulses are counted for a specific period of time (e.g., 1 second, or subdivision thereof).

Fig. 5(a) shows the basic block diagram for a frequency counter. The sections include the DCA, main gate, trigger, input amplifier, main-gate flip-flop, timebase, and a display clock.

The DCA is a totalizer counter as shown in Fig. 4. The overflow stage is a flip-flop that is SET when the MSD carry output goes HIGH. The overflow flip-flop turns on a lamp to make the operator aware of the overflow condition so that the data can be disregarded.

Since a frequency counter measures events per unit of time, i.e., cycles per second, the DCA must be turned on only for a given period of time (e.g., 0.1, 1, or 10 seconds). The main gate, main-gate flip-flop, and timebase sections are used to allow input pulses into the DCA for the designated period of time.

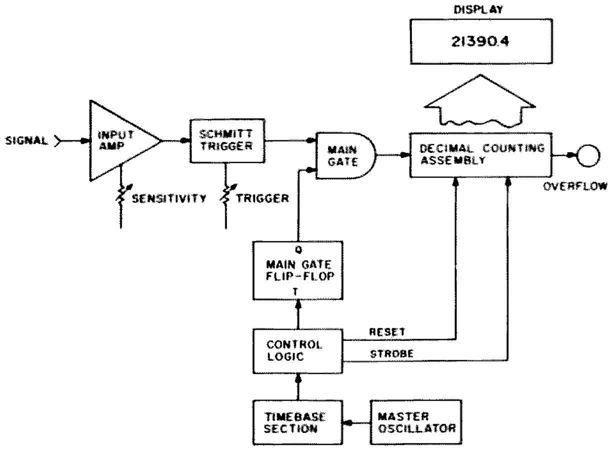

Fig. 5(a). Frequency-counter block diagram.

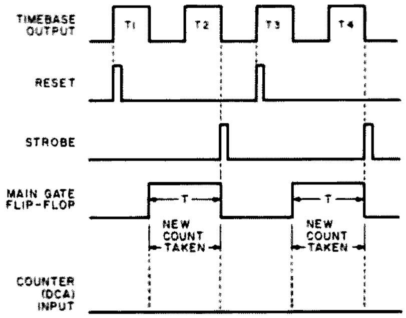

Fig. 5(b). Waveform for Fig. 5(a).

The timebase section consists of a crystal oscillator that produces pulses at a precise rate such as 100 kHz, 1 MHz, 4 MHz, etc. A chain of decade dividers such as the 7490 is used to reduce the crystal-oscillator frequency to a lower frequency. The timebase-output frequency will be 10 Hz for 0.1-second, 1 Hz for 1-second, and 0.1 Hz for 10-second measuring periods.

The timing diagram for one complete interval of an EPUT counter is shown in Fig. 5(b). Pulses t1, t2, and t3 are output from the timebase section. When t1 goes HIGH, the control-logic section generates a short pulse to reset the DCA to zero. When t1 goes LOW again, the Q output of the J-K main-gate flip-flop will go HIGH. The main (AND) gate has one input tied to the Q output of the flop-flop, and the other input is tied to the signal being counted. As a result, the main gate passes input pulses to the DCA only when the Q terminal of the flip-flop is high.

The flip-flop remains set until the negative of t2 occurs. At that time, the Q output of the flip-flop drops LOW, turning off the flow of pulses into the DCA, and causes the control-logic sec-

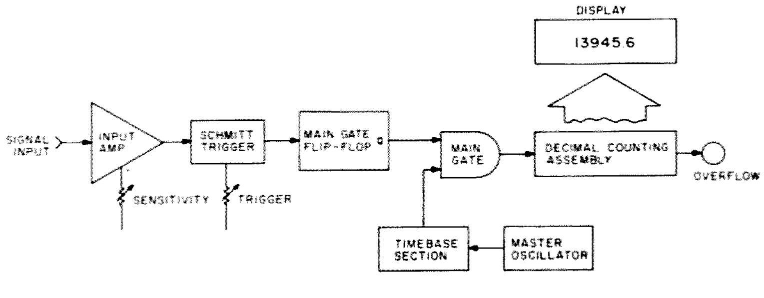

Fig. 6. Period-counter block diagram.

tion to generate a strobe pulse. This pulse tells the DCU latches to transfer data from the counter to the decoders. The display, then, shows only completed count cycles and will hold the previous count until the end of the next interval. (The trigger and input amplifier circuits will be discussed in part II of this article.)

The frequency counter of Fig. 5(a) counts frequency, i.e., events per unit of time, because the DCA is enabled only for a specific unit of time. The frequency of the input signal is the number of counts accumulated on the DCA divided by the timebase period in seconds. The basic formula, with P = time in seconds and f = frequency in Hertz, is f = counts on DCA/P. Therefore, P = DCA count/f. For example, if the DCA count is 8026 and the timebase frequency is 10 kHz, then $P = 8026/10^4 = 0.8026$ seconds.

The resolution is the smallest time interval that can be measured on the counter and is defined as the reciprocal of the timebase frequency. In this example, it would be $1/10^4 = 0.1$ ms.

Period Counters

Period is the reciprocal of the frequency being measured: $P = 1/f_{Hz}$. We can use the digital counter to measure period by reversing the roles of the timebase and input amplifier trigger. In Fig. 6 we see the block diagram of a period counter; compare with Fig. 5(a). Note that the main-gate flip-flop is turned on and off by the output of the input-signal trigger. The DCA is actually counting the number of timebase pulses between successive input pulses.

In part II, I will discuss DFC applications and some of the problems that arise in less-than-ideal practical situations. ■

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Messing with Heath

This 101 control mod proves fun and easy with frequency. Your rig deserves it.

A remote vfo is useful for a lot more than just chasing DX. You can search for a clear frequency (and sometimes find one) without giving up the original, or stay with a net while moving off frequency to pick up side traffic and intercept QRM. In a contest, you might leave the main vfo on a pileup and tune the remote down the band for a few points. By switching back and forth, you can keep track of the pileup without sacrificing other contacts.

A second vfo will also serve as an RIT if your rig doesn't have one and could even be set up to monitor two frequencies at once. Of course, when you aren't doing any of these, you *can* use it to work DX stations on split frequencies.

Even though Heath didn't offer a matching remote for the HW-101, it's neither expensive nor difficult to add this versatile accessory to your HF lineup. The HW-101 will work with a variety of vfo circuits, and interfacing one to your rig is a simple procedure.

Suitable Donors

The search for a compatible unit is made easier by realizing that several Heath products were designed around the same vfo parameters. This means that an LMO (linear master oscillator) taken from a worn-out SB-101 transceiver or SB-400 transmitter, for example, will perform as well as a vfo retrieved from a junked HW-100 or HW-101.

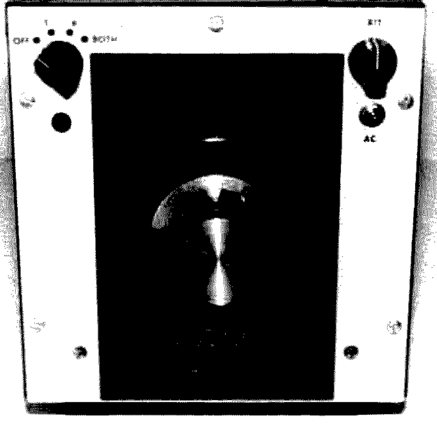


Photo A. A duplication of the HW-101's internal vfo is installed in a recycled Heath VF-1 cabinet. The original vfo in this 25-year-old box could drift through most of a band in one evening. Perfect for gradual QSY in a contest.

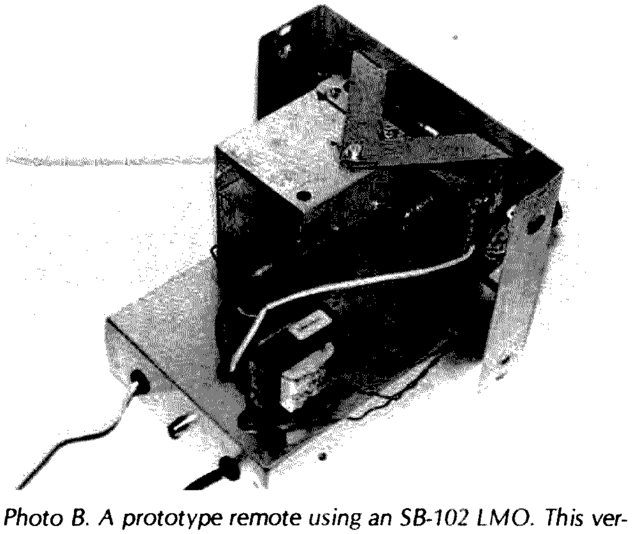


Photo B. A prototype remote using an SB-102 LMO. This version is self-powered by an on-board 10-V-dc supply.

Old, abused, and just plain broken Heathkit/HF products are often available at bargain prices. Aside from providing the vfo you want, these castoffs will give up a wealth of good reusable parts and a cabinet for your next project.

If you don't turn one up that way, consider building a clone of the HW-101's internal vfo. Obtain the enclosure, variable capacitor, and other critical components from Heath. The tube and hardware are commonly available. You might devise your own dial assembly, or buy those parts from Heath, too. Consult the owner's manual for Heath part numbers.

Duplicating the internal vfo costs more than building a generic 5-MHz circuit, but it does have the advantage of guaranteed compatibility. Also, having step-by-step instructions in the manual eliminates all the guesswork and simplifies alignment.

A Heath SB-640, although rare, is a prize find. This is a remote LMO once sold as a companion to the SB-101, but it makes an excellent remote for the HW-101. Locating one of these also saves the trouble of installing an unattached vfo into a new cabinet.

If you're willing to experiment, you might find a usable vfo in a discarded piece of non-Heath equipment. Any "backwards-tuning" 5.5-5.0-MHz unit capable of 1.5 volts rms across 50 Ohms should have potential.

Finally, some commercially-made auxiliary vfo's are compatible with the HW-101. Buy-and-try is the method here, but the Kenwood 520 and 820 products should be safe bets. For the dedicated build-it-yourselfer, some other sources are mentioned later. The installation/interface tips described in this article are generally applicable to almost any combination you decide to try.

The Basic Remote

Fig. 1 shows the setup used with a duplicate HW-101 vfo, whether salvaged or built from scratch. This arrangement also covers home-built or other tube-type vfo's requiring 150 volts. A small 12-volt-dc supply is built into the transceiver to power the new relay, K1, and an RIT relay (if used) in the new vfo. This dc source is usable with other modifications, too. Spare contacts on the antenna relay provide 12 V dc at separate points in both receive and transmit modes. Through switch S1, this control voltage determines when relay K1 is activated, placing the outboard vfo into operation.

The relay can be mounted in any convenient location; I attached it with an L-bracket to the rf cage. The rectangular cutout in the rear panel is an almost perfect fit for a nine-pin molex®-type female connector (Radio Shack #274-239). Either a new phono socket or the spare on the rear apron becomes the "vfo in" connector.

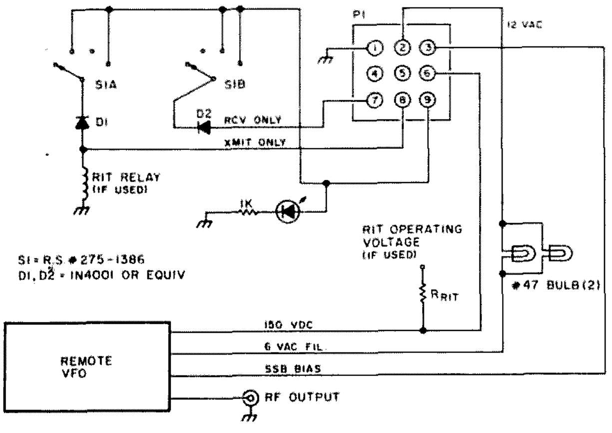
As indicated in Fig. 1, some minor rewiring of the regulated 150-V-dc line and vfo input is needed. This is done to route them through the new relay instead of direct to the internal vfo. These changes are straightforward and easily reversible.

Fig. 1 also shows the control switch and "on-site" wiring of the remote unit. With S1 in its first position, the main vfo is always used. In the next position, control is split, with the main unit receiving and the remote transmitting. The third position is just the opposite, and the fourth position puts the remote unit in complete transceiving control. Diodes D1 and D2 are "one-way signs." They prevent the control voltage from running backwards down the wrong line when the switch is set for remote transceive. For example, the RIT relay would be useless without D1.

The Better Remote

Aside from the benefits of dual-frequency control, an LMO offers dial accuracy approaching the level of digital readout. The circular dial reads 0–100 kHz rather than 0-500 and rotates five times per band segment instead of once. The 1-kHz markings can be visually interpolated to 200 Hz.

Another advantage is that warm-up drift is almost eliminated. The LMOs stabilize much faster than the original vfo and the solid-state version operates at room temperature in its own cabinet. This limits warm-up drift to the hfo circuit in the transceiver, which is minimal. With all this in mind, you may find yourself using the remote LMO most of the time. It's worth a little effort to find one.



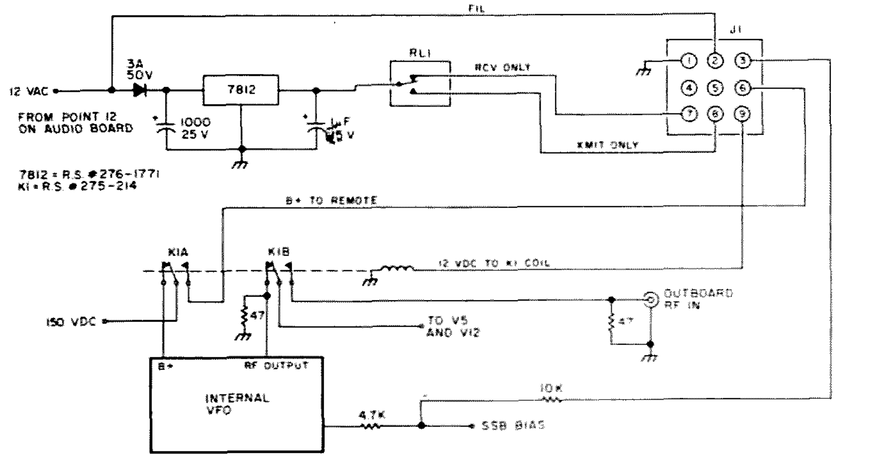


Fig. 1. Relay and 9-pin socket connections inside the HW-101. The 12-volt supply can be built on a terminal strip. Also shown is the remote-unit wiring. P1 is at the end of a 7-wire cable and mates with J1 on the transceiver rear panel.

Depending on how old it is, an LMO-equipped Heathkit will contain either a tube-type or solid-state unit. The older ones (and the SB-640 remote) require 150 V dc and should be set up the same way as the vfo in Fig. 1.

The later LMOs do without the tube and operate on +10 V dc regulated. Fig. 2 shows the changes in the interfacing arrangement and a power supply for the LMO. You could get by with a ten-volt zener on the relay supply, but the circuit shown is sturdier, safer, and more reliable. Be sure to adjust the regulator for ten volts output before connecting it to the LMO. The Fig. 2 method is readily adaptable to other solid-state remote units requiring 9 to 13 volts.

You may want RIT in the remote, especially if you plan to use it very often for transceiver control. Any circuit that works in the HW-101's internal vfo should be usable. The RIT is connected to the stator (stationary) plates of the main tuning capacitor, which in the Heath LMO is impossible to reach. Look for a tinned bar with several components soldered to it, just below the air variable, and make the connection there.

Once RIT is installed, the LMO will need realignment.

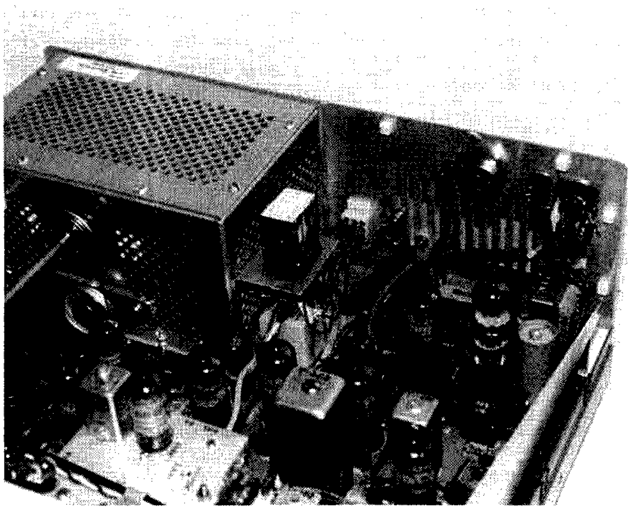


Photo C. Close-up of the HW-101 showing suggested locations for relay K1, the 9-pin socket, and remote-input phono socket.

Even without this modification, some of the more battered LMOs I've used required touching up. These units came from the factory pre-assembled, aligned, and sealed. No information was given on the circuit or its adjustment, so I tried and erred until the secret was revealed.

Calibration is done from the front of the enclosure with insulated tools. At 0.0 (shaft fully counterclockwise, then up 10 kHz), set the coil for 5.5 MHz. Go clockwise five turns and set the trimmer for 5.0 MHz. Repeat this procedure until one turn of the shaft changes the frequency exactly 100 kHz. Take some time doing this, and you'll end up with an exceptionally accurate and linear readout.

The Over-Achiever's Remote

Occasionally the need may arise to monitor two frequencies at once. This usually means trying to impress a visitor with your station's versatility, but there are more legitimate uses. If you've always envied the guys who call CQ DX and casually add, "Listening on this frequency *and* 7090 kHz," then this extra step is for you.

Fig. 3 shows one method of activating two vfos at the same time. The second new relay (K2) is drawn in squares to distinguish it from control relay K1. Whichever vfo is not being used will be turned on and connected to the mixer inputs by closing K2. This results in both units controlling a received frequency independently but simultaneously.

This system is foolproofed against transmitting on two frequencies by powering K2 from the receive-only 12-V-dc source. The relay automatically opens when the rig is in transmit mode. Nevertheless, a prominent warning light should be included as a reminder that the transmitted signal may not be in the same place as the one you're listening to.

The circuit in Fig. 3 is limited to remote vfo's that do not take their B+ voltage from the 150-V-dc line in the HW-101. The OA2 regulator tube can't handle two vfo's at the same time. If this feature is important to you, either a solid-state remote unit or a separate 150-volt supply will be needed.

Mount the second relay next to K1 and keep rf leads short and direct. Some solder-and-try with the .005 discs may be necessary if unwanted oscillation occurs.

Some Other Approaches

You may find, or already own, another Heath rig with the right vfo/LMO. If it's not ready to retire for parts, it

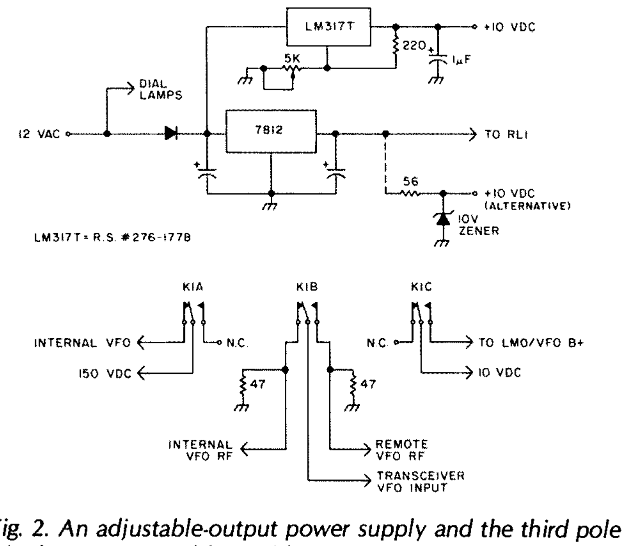


Fig. 2. An adjustable-output power supply and the third pole of relay K1 are used for solid-state remote units.

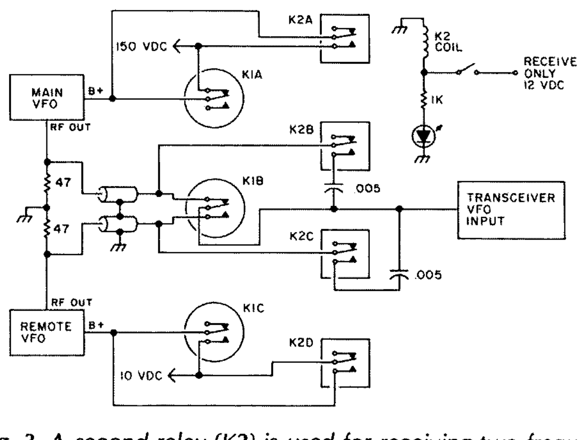


Fig. 3. A second relay (K2) is used for receiving two frequencies at the same time.

can be set up easily to function either normally or as a remote vfo.

For example, an SB-303 receiver's LMO can be used exactly as shown in Fig. 2. Mount the control switch in a separate box or in place of an expendable receiver control such as the rf attenuator. LMO output is available on the rear panel. If operating voltage is brought to the LMO through spare phono sockets, the receiver itself need not even be turned on. In the same way, an SB-110 six-meter transceiver could "loan out" its LMO when not otherwise occupied.

If by choice or necessity you build an outboard vfo, you would probably save some time by referring to previous articles on Heath companions. In "An External Vfo for the Heathkit SB-101" (CQ, September, 1972), K4TP described a tube-type unit. His circuit uses commonly-available parts and a simple dial mechanism.

VK5JZ/SK built a two-transistor version which is described on page 23 of the ARRL's *Weekend Projects for the Radio Amateur*. Look through back issues of *73* for other articles that may include a 5-MHz circuit. One in particular which has potential is VE5PZ's "An 820S Remote Vfo," in *73* for June, 1981.

These circuits should be "laundered" through a buffer. The triode section of tube V5 is not used in the HW-101 but functions as a buffer in the SB-series transceivers. By adding a few parts, V5B can be put back to work. See Fig. 4. The new components will fit into vacant holes surrounding V5 since the same circuit board was used in both transceiver types.

Refer to Fig. 1 and treat the buffer as though it were the remote unit. The actual outboard can be left on continuously or switched along with the buffer. But remember the limitations on the built-in 150-volt regulator; it won't run two of anything at once.

The V5B buffer should also benefit some other vfo's you might build or buy that don't perform properly with the HW-101. Low power output is one symptom, oscillation in the mixer is another. The buffer is more forgiving of impedance mismatch and too-high vfo output than the mixer stage.

Another step that's likely to improve compatibility is also shown in Fig. 4. The SB-100 series had more sophisticated mixer input circuits which can be added to the HW-101. Again, vacant holes are available on the bandpass board.

The SSB bias line shown with the Heath remotes is used to offset the vfo frequency when changing from LSB to USB or CW. Recalibration of the dial is then unnecessary. This feature could be included in home-built or other circuits, but probably is not worth the trouble.

Summing Up

Length of connecting coax cable and terminating resistance is considered critical with many vfo designs. In fact, Heath specifies 24 inches of RG-62 (93-Ohm coax) for interconnecting their LMOs.

At different times I've used an HW-101 vfo, several LMOs, and a few workbench contrivances. In no case was anything more than a convenient length of RG-58 needed for good performance. But don't overlook the 47–68-Ohm resistor at the mixer input and careful vfo alignment.

There's no disputing that the HW-101 is an economy radio, but you're in the company of many loyal and satisfied owners. A remote vfo will open the door to more enjoyable HF operating with a small investment of money and time. It's a very effective way to make the most of hamming on a budget.

Let me know if you encounter any problems, and I'll help if I can. ■

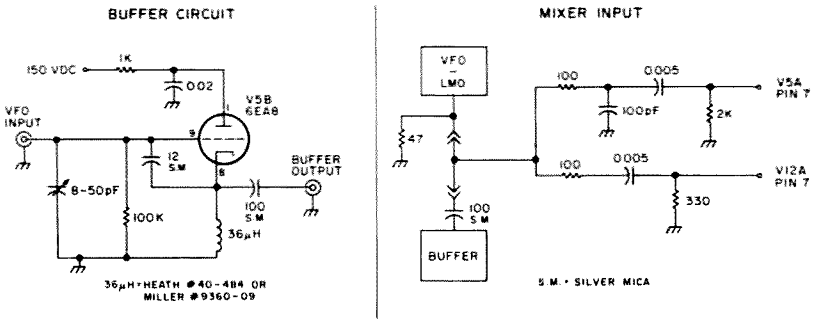


Fig. 4. A buffer for non-Heath vfo's and improved mixer input circuit.

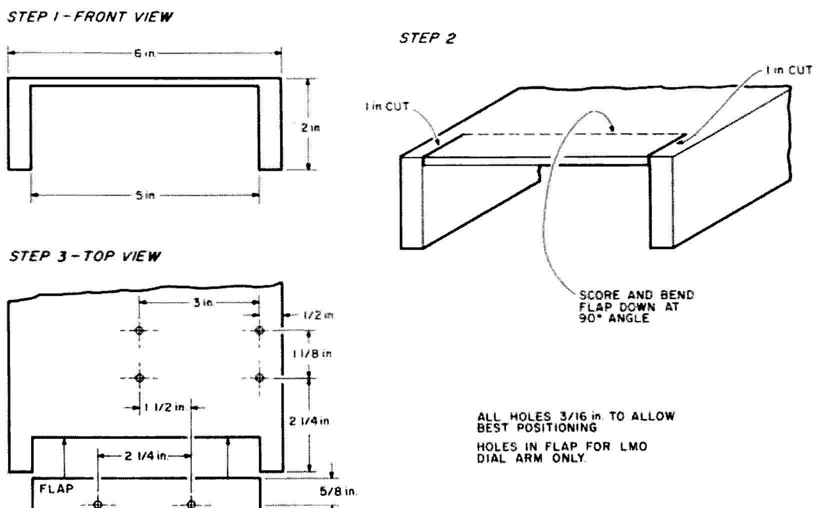


Fig. 5. Three steps to a chassis for Heath vfo/LMOs. One—cut out 5" of chassis front. Two—make 1" cuts on top, score between them, and bend down. Three—drill mounting holes as shown. Use the front panel from an HW-101 or donor equipment as a template for the dial mounting.

References

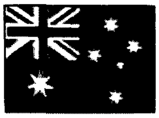
Malin, "Increasing the Operating Capability of the Heathkit SSB Transceivers," CQ, August, 1972.

Heathkit Owners' Manuals for models SB-640, SB-102, and SB-401.

73 INTERNATIONAL

Each month, 73 brings you ham-radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Perry Donham KK2Y.*



AUSTRALIA

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VK9Y—COCOS KEELING

First discovered in 1609 by William Keeling of the East India Company, these islands are located 2768 km northwest of Perth, West Australia.

The Cocos Keeling group consists of two main atolls plus several smaller islands. The main islands are West Island, Home Island, and Direction Island, with the other larger ones being Prison, Horsburgh, and North Keeling. On these islands, the highest point above sea level is only six meters, which poses some problems annually during cyclone season.

Except for the odd sailing ship stopping there briefly over the centuries, the islands remained uninhabited until 1825 when Alexander Hare settled there, followed two years later by the first of the Clunies family.

In 1886, Queen Victoria granted all of the islands' lands above high water mark to the Clunies-Ross family, thereby starting a family tradition where the head of the family was called "King of the Cocos."

When Clunies first settled on these islands, he bought with him several Malays as workers on the islands' only commodity, copra. There are now 370 direct descendants of these original Malays, a very family-conscious and happy people who call themselves "Cocos Malays." They speak both Malayan and English and follow the Muslim religion.

The rest of the islands' population consists mainly of Australians on a two-year tour of duty with one of our government departments.

Radio was first introduced to these islands in 1914, when there was a cable and wireless station located on Direction Island. In the 1940s, an airstrip was built on West Island which has since been upgraded to take large jet aircraft, one of which is the fortnightly commercial flight from Australia.

In 1978, the Australian government bought most of the islands from the Clunies-Ross family for $6.25 million, and at present, it is trying to buy what is left of the family estate.

This year, the Cocos Malays are to be given, under United Nations supervision, a free choice as to whether they wish to have independence, free association with, or integration with Australia. As there is much travelling by the islanders between Cocos Keeling and Australia and they come under the West Australian Health, Dental, and Schooling System, the feeling is that soon we will have another 370 Aussies and permanent jurisdiction over the Cocos Keeling Islands.

Amateur radio is a late comer to these islands, with VK9AJ, as far as records show, being in 1956 the first to activate amateur radio from Direction Island. Since then, there have been many operations by outsiders since none of the local Malay population has taken up amateur radio, although several do operate CB equipment. The operation of amateur radio has become extremely difficult of late, however, due mainly to there being no tourist facilities on the island, and the only way to stay for a short period is to be invited to live at someone's house. This poses some problems as all the Cocos Malays' homes are closely grouped together, with a large number of TVs, broadcast receivers, cassette recorders, and VCRs (the amateur's nightmare).

I quote part of a letter to me from Neil VK6NE/VK9YE: "To operate and not create TVI/BCI, or bad neighbor relationships, is very difficult in the living area. To use over 25 Watts will get you into some appliances. 100 Watts is OK if you tee it up with the neighbors beforehand, for a few hours operation only. 400 Watts and you will be put away. No way will the island's Administrator allow you to stay if you don't stop making the appliances emit strange sounds, and the Administrator's word is law on these islands."

Two of the most active operators of late were Paul VK9YB and Alex VK9YA, due to jobs with one of our government services which took them through there on a fairly regular basis. They have been reassigned now and are inactive from this spot, but even they could get into trouble.

One example of the problems in operating amateur radio from here happened to Alex VK9YA. Deciding to get on the air from the single-men's quarters during one of his many stopovers, he fired up his rig late at night, only to find an irate neighbor at his door. It seems that as the island's own 50-Watt broadcast transmitter goes off air during the night and starts up first thing in the morning, this chap was leaving his clock radio switched on, with the volume turned up full as a wake-up alarm. You can imagine what happened when Alex fired up his HF gear from two rooms away; the neighbor, not being interested in amateur radio, was turning very nasty and made Alex shut down his operation.

Cress VK9YC, whose home callsign is G5NDS, did not have these problems, as he is a son-in-law of the Clunies-Ross family and operated from its castle-like home on Home Island. However, with the negotiations by the Australian government trying to buy this property, you may not hear Cress from there again.

Mike Beall VK9ZYX, a limited license holder, in his shack on Cocos Keeling. Limited to 52 MHz and above, Mike still gained many awards on the 6m band.

Frank VK9NYG at his operating desk on Cocos Keeling.

A DX expedition, even if allowed to operate (which I doubt), would not be warranted, going by the figures given to me by Paul VK9YB. Out of 2500 contacts during his last stay, only 125 sent cards direct, some with no return postage included and some with only one IRC. It is worth mentioning here that we have one of the highest postage costs in the world, with air mail to the States now 75 cents and Europe 85 cents. Of the rest of his contacts, he is now getting 400 cards per month by the bureau, with a large number of SWL cards.

Perhaps the above is due to Frank VK9NYG, a Novice operator who, although limited in power and bands of operation, had, during his two-year tour of duty on the islands, 22,000 contacts (some duplicates, of course). Of these, Neil VK6NE, Frank's QSL manager, says that 6,500 cards were sent back direct, regardless of whether or not sufficient return postage was included, and 7,800 cards were sent by the bureau. Not a bad tally for a Novice operator, mainly operating on 28 MHz with 30-Watt PEP output. 21 MHz was there as a backup but seldom used.

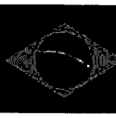
Frank enjoyed a unique relationship with the islanders, as the radio telephone on the islands shut down at night and sometimes was not at all reliable during the day. The islanders found that they could use Frank to get info for them from the mainland, and he was able to be of assistance to yachts in trouble in the area of the Cocos Keelings. This gained him some acceptance for amateur-radio operation not granted to other amateurs. Frank and his wife Ann are back in Australia, and Frank has upgraded to a full call, now being VK6ACC.

Incidentally, Neil VK6NE is also the WIA's Federal QSL Manager, and he spent two weeks as VK9YE, operating from Frank's shack, before Frank left the islands.

With the Australian government just finishing building a six-million-dollar high-security quarantine station out there, casual visits by amateurs or anybody else will be even harder in future, and unless we get an active amateur posted to one of the government departments on the islands, I feel VK9Y will slowly start to creep up the most-wanted list again.

As Melbourne is a long way from Cocos Keeling, I must thank Neil VK6NE/VK9YE, Paul VK5CGR/VK9YB, and Ken VK3AH, who together gave me most of the information for this article.

P.S. I have just received word that the Cocos Malays just voted on their future and the vote was overwhelming in favor of integration with Australia. To use a typical Australian expression, "Bewdy mate, she's a bottler decision!"



BRAZIL

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Brazil

RECIPROCAL AGREEMENT

One day before my last trip to the United States, which was on April 7, I received a telephone call from Ricardo A. A. da Silva PT2RS, one of the members of the Brazilian Amateur Radio League (LABRE) staff. He lives in Brasilia, the capital city, but he was in Rio de Janeiro for a few days due to his job.

First of all, he passed on the message from Valmir Jacinto Pereira PT2FA, president of LABRE, congratulating 73 for the opportunity it gave us, through our column, to make known a few things about Brazilian amateur-radio activities.

The president also wishes to extend an invitation to all foreign authorities of the countries with which Brazil does not have yet a reciprocal agreement to get in touch with the Brazilian League in order to work on this agreement. Up to now, Brazil has reciprocal agreements with West Germany, Bolivia, Canada, Chile, Colombia, Costa Rica, Denmark, the US, Great Britain, Northern Ireland, Panama, Paraguay, Portugal, Dominican Republic, Sweden, Switzerland, Uruguay, and Venezuela.

According to Brazilian law, it is not allowed for a foreign citizen, while in Brazil, to have or use any communication equipment if the country of which he is a citizen does not have a reciprocal agreement with Brazil. Transgressing this law will result in the confiscation of the equipment, the detention of the violator for one to three years, or his banishment from the country. All inquiries and general correspondence to the League should be addressed to the administrative headquarters at SCE Sul, Trecho 4, Lote 1-A, 70000 Brasilia, DF, Brazil, or to PO Box 07.0004, 70000 Brasilia, DF, Brazil. Telephone: (061) 223-1157 or (061) 226-0504.

EUGENIO'S FIRST CRY

This happened in the city of Fortaleza and was reported by America PY7VBG: When little baby Eugenio was born on December 8, 1982, nobody could imagine that his first cry would be transmitted on the air on a frequency full of friends of his mother, Maria PT7LB. When Maria arrived at the hospital to have her baby, at about 4:00 am, the only room available did not have a telephone, so she decided to keep with her the 2-meter hand-held equipment to get in touch with her husband; he had had to return to their home to stay with the other children, who had remained sleeping.

According to her doctors, Braga PT7WFB and Lazaro PT7HP, the baby would be born at about noon. However, at about eight o'clock in the morning, while speaking with her friends on the frequency, she felt the first hurt, and a few minutes later the first cry of Eugenio was transmitted on the air and heard by all friends who were on the frequency.

Without a license, Eugenio had to finish his first transmission a few seconds after the beginning, and then he went to his birthplace for sleeping.

CWP AWARD

Issued by CW Petropolis, the CWP award may be obtained in three different classes. Contacts eligible: only two-way CW mode, after December 1, 1983.

Class I—Work 10 Brazilian cities plus 2 contacts with CWP members or delegates.

Class II—Work 20 Brazilian cities plus 4 contacts with CWP members or delegates.

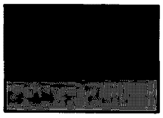
Class III—Work 30 Brazilian cities plus 6 contacts with CWP members or delegates.

One CWP member or delegate may be logged more than once, but only if worked on different dates or bands.

SWL: Same rules.

No QSL, only GCR. Fee: 7 IRCs. Mailing address: CWP, PO Box 90415, 25600 Petropolis, RJ, Brazil.

CWP members: KA9KUH, PP2ADY, PP7JCO, PT2ACZ, PT2GK, PT7WA; PY1s: AFA, APS, AYE, AZG, BPR, BVY, CC, DFF, DK, DMX, DRW, DWM, DYO, EBK, EBN, ECL, EWN, JF, KT, MIT, OB, PL, QN, QQ, RD, TBW, TG, UBS, URO, UTZ, UUW, UWI, VEC, VMV, WXU, YOC, YOV, ZFF; PY2s: AC, IL, KQ, MC, MT, ORW, RLQ, RRG; PY3CJI, PY3MQ, PY6AMJ.



FEDERAL REPUBLIC OF GERMANY

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Federal Republic of Germany

IARU REGION 1 CONFERENCE, 1984

The IARU Region 1 Conference, 1984, took place from April 7th to 13th, in Cefalu, Sicily. Back in 1981, the last Region 1 Conference, in Brighton, UK, had voted for Italy by a plurality.

During such meetings, which are held every three years, the member national societies agree democratically to important decisions and suggestions for the future. That means that single-nation interests have to be combined on a level which is acceptable for every member. In the voting, each nation has one vote whether it has 50,000 members (as for example, the DARC—Deutscher Amateur Radio Club) or only 40.

Very often the negotiations are extremely difficult and many result in a compromise. So not seldom discussions last until the late night. The official language of the conferences is English, and procedures are parliamentary procedures according to Roberts Rules.

Three committees were set up in 1981 to report this year. Committee A is dealing with shortwave and administration subjects, Committee B with subjects concerning VHF/UHF, and Committee C with financial subjects.

As already mentioned, some small teams had to be founded (besides the three committees) to handle negotiations successfully. That means that a national society wanting to bring its interests into several subjects has had to have number of delegates to spread around.

A great deal of preparational work is done by these teams—HF WG (High Frequency Working Group), VHF/UHF WG, and other teams—in the time between conferences. But their suggestions are not binding because not every nation's interests have been represented. For suggestions to come into force, the whole conference has to agree.

The executive committee has suggested changing this procedure to introduce written voting so that decisions also could be made during the three-year period between conferences. DARC supports this proposal.

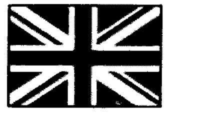
In a future column I will report on results, but you may be interested in other matters under discussion.

Because of the increasing numbers of QSL cards, we think it advisable to propose a standardization regarding card size and address field. (Naturally it will take several years until the standards have become common use.) Similar efforts towards standardization have been made within the two other regions. According to our experiences, we think a possible compromise would be: size 9 × 14 cm, weight 190-250 grams/sqm, address in the 12-mm leftover space at the end of the QSL (for an automatic handling of the cards).

In addition, we want considered additional regional subsidies to our local AMSAT organizations. We also suggest stopping unnecessary use of special prefixes for each and every thing. Further, we appeal for reflection upon the existing RST system for an easier way of evaluation. QRK expressed "R 1-5" seems to be sufficient.

It is already known that RSGB (UK) wants a change of the bandplan within the 28-MHz band. RSGB intends the integration of an FM-repeater range. SSA (Sweden) proposes producing and publishing a communication manual to improve radio discipline. Also they suggest a coordination of the intruder monitoring service within Region 1.

According to resolutions of Region 2 (America) and Region 3 (Asia) conferences, a uniform QTH-locator system seems to be possible now. Also, there are suggestions to reduce the 24-hour contests to 12 hours and eventually to hold two contests on the same weekend.



GREAT BRITAIN

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England

THE UK SCENE

Band occupancy is a problem to which I have referred in previous columns in connection with the need to continue to use the 10-meter band during periods when propagation is poor. Most people seem to accept the possibility of such bands being lost to broadcasting or to CB if used only once every 11 years or so.

However, the need to demonstrate that amateur allocations are not a waste of valuable spectrum is not confined to HF. Indeed, the pressures from the likes of land mobile PMR (private mobile radio) and military users in the VHF and UHF bands are probably much greater than those experienced in the lower frequencies. At least this seems to be the case in the UK.

The need to occupy the 1.2-GHz band to ensure that it remains in the amateur service was a major motivating factor in recent applications for amateur-television repeaters in this band. Licenses were duly granted by the Department of Trade and Industry (the government department responsible for the Amateur Service) in early 1984.

These are the first such licenses to be issued in the UK and it is hoped that they will have a significant impact on amateur-television activities. By the time you read this, the initial five repeaters are expected to be operational. The callsign, location, and channel number of each is as follows: GB3GV (Leicester) and GB3UT (Bath): RMT1; GB3TV (Luton), GB3UD (Stoke-on-Trent), and GB3VR (Worthing): RMT2.

The frequency allocations (in Megahertz) for the two channels in use are as shown here:

	Vision in	Vision out
RMT1	1276.5	1311.5
RMT2	1249.0	1318.5
	Sound in	**Sound out**
RMT1	1282.5	1317.5
RMT2	1255.0	1324.5

The repeaters operating on channel RMT1 will receive both AM and FM signals but will reradiate in AM. Repeaters operating on RMT2 will receive and transmit in FM only (the sound frequencies shown are for AM; FM systems will utilize a 6-MHz sound subcarrier).

Vision signals are to be 625-line, negative-going with positive-going synchs. All FM signals are limited to a deviation of 6.5 MHz with CCIR pre-emphasis (and therefore similar to UK PAL broadcast standards). With horizontally-polarized antennas, repeaters will be activated by the presence of a valid video signal at the receiver input.

The British Amateur Television Club operates a recorded-announcement service giving details of all aspects of the club's television activities. From the US, this can be called on 44 (533) 600108. Please note that I am not a TV enthusiast and therefore cannot oblige with any more information if anyone is thinking of writing to me on the subject!

BARTG

1984 is the Silver Jubilee of the British Amateur Radio Teleprinter Group (BARTG) whose quarterly newsletter provides a wealth of information for RTTY enthusiasts (and those interested in FAX, AMTOR, and data transmission). Details of BARTG membership, publications (including *RTTY The Easy Way*), and products (including PCBs, etc.) can be obtained from John Breedle G6MOK, 161 Tudor Road, Hayes, Middlesex UB3 2QG, England. Please enclose an IRC or two for return postage.

BREAKTHROUGH

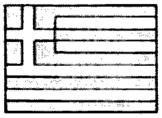
Following my previous comments on breakthrough in the 2-meter amateur band from the newly-legalized cable TV in the UK, it seems that problems may also occur with plans for Direct Broadcasting by Satellite (DBS). The BBC has been given government permission to begin transmitting DBS signals in 1985/86, and manufacturers already are looking at domestic receiving equipment requirements.

The European DBS bands will be around 11.7 GHz and designed for reception with a 1-meter-diameter dish. Such high frequencies require two i-fs, the first at the dish itself and the second on the set top. The equipment manufacturer's committee, BREMA (British Radio and Electrical Manufacturers Association), has selected initial intermediate frequencies around 1.2 GHz and 144 MHz. One can just imagine the problems for the average punter trying to receive very low level DBS signals in the presence of high-power amateur stations operating (quite legally) at the receiving system's i-fs.

These problems have been put to BREMA not only by the RSGB but also by the IBA (Independent Broadcasting Authority—the UK commercial TV operators) and the DTI (Department of Trade and Industry). Some sense has prevailed at 1.2 GHz at least, with a promise of a rethink. However, BREMA does not accept, per se,

a problem at 144 MHz and insists on more information before making any changes to its proposals. A working party has therefore been set up (typically British approach) to measure the levels of screening that can be achieved in practice and, presumably, therefore decide if breakthrough might occur.

Amateur signals are likely to be the only source of strong rf signals in the domestic environment, and it seems to me, and I suspect to the RSGB, that BREMA's attitude is somewhat negative. Rather than seeking to screen against signals that will be a problem, why not simply choose an intermediate frequency in another part of the spectrum where strong rf is not likely around the home? As if amateur stations do not have enough problems.



GREECE

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Greece

Starting with this column, I would like to present to you some of the SV hams of whom you may have heard or even talked to on the bands. As I have already mentioned, DXing was something unknown a few years ago with the exception of one or two people, but over the last four years more and more new amateurs have joined a small team seriously involved with the HF bands. Nowadays there are more than 15 SV amateurs who are active almost daily.

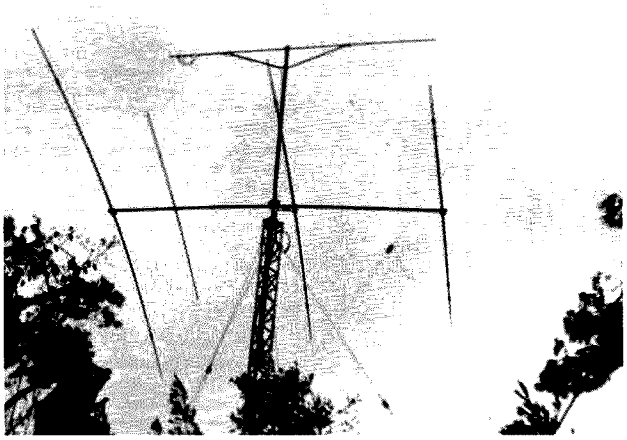
So, I'm starting the presentation with Cliff SV1JG, who is likely to be one DXer well-known worldwide and probably the most active SV amateur during the last and the present year. You may also have heard him transmitting from Mt. Athos back in 1979 and 1980 and from SV5 and SV9 quite a few times during the last 5 years.

Cliff, who is now 32 years old, is living in Ekali, some 15 miles north of Athens, in a place which was chosen very carefully with antenna installation in mind! He has already 5-band DXCC, WAZ, WAC, and a very good score in phone and CW DXCC. He prefers to work SSB and CW, and in a few days he will try the challenge of a new mode (RTTY) with his Commodore 64 computer.

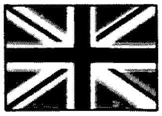
Of course, things were not so easy when Cliff started out. In 1978 he was using a TS-520 and dipoles on all bands and he managed to work more than 200 countries in less than a year and a half. Cliff also takes part in a lot of contests like the *CQ* Worldwide Contest, the WPX, the Scandinavian, the All Asian Contest, and many others. When 160 meters became available to Greek amateurs, he was one of the first to work there with a full-size inverted vee, with very good results. As he is able to transmit 300 PEP input (B class license), he gave a lot of people a new one on the top band.

Today, the station in SV1JG's QTH consists of a Yaesu FT-102 HF receiver, a Den-Tron MLA-2500 B amp, and a Heathkit® tuner. The antenna is a 4-element Cushcraft for 10-15-20 meters; dipoles and verticals are used on the low bands. For VHF and UHF, Cliff is using a Yaesu FT-480R and FT-780R, and the antennas are a 14-element KLM VHF and a 19-element F9FT UHF.

Cliff was at the Dayton Hamfest in 1981, and I hope that I will be able to join him for a planned trip in the near future.



SV1JG's antennas.



HONG KONG

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Hong Kong

Since the advent of the class B (no-code) license in Hong Kong, we now have over 100 enthusiastic VHF operators. A few are operating on six meters and one, VS6XLA, is now on satellite. The HF licensees don't seem to change too much; as fast as new arrivals get on the air, old ones leave. By the very nature of Hong Kong, we do get quite a few expatriates who come for two or more years only. HF licensees also number about 100, although there are very few active.

One of the major problems is finding suitable accommodation in Hong Kong, where high-rise apartment blocks proliferate, each building normally topped by a crown of thorns of TV antennas, each with its own broadbanded amplifier!

Socially, the locals and expatriates meet each Tuesday evening at the Cable & Wireless Sports Club, Caroline Hills Road, in the district of Causeway Bay on Hong Kong Island. This is very close to my home, and any visiting amateurs are welcome to visit me first (telephone 5-772313, between 5:30 and 6:30) before going on to the club.

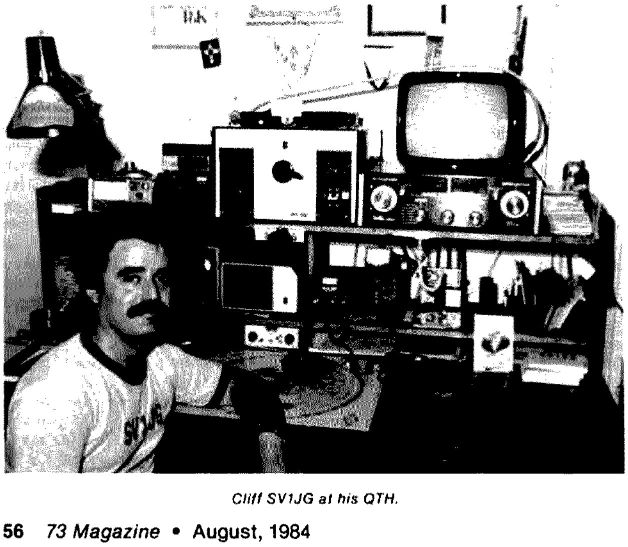
Visitors to Hong Kong who wish to operate can obtain a license to do so in 30 minutes upon application at the Post Office! All that is required is to show your original license and passport and have a photocopy of these for their files. In the event that you would be a resident for more than 90 days, then a full local VS6 license would be issued. These privileges are granted to all license holders from countries with which the United Kingdom has reciprocal agreement.

During the first week of February, I had the privilege of operating once more in Macao, and in four days of operating I made 3360 QSOs, all on sideband. With the help of my host, Jose Sousa (now XX9WW), we put up dipoles on 40 and 80 meters, and from the pileups on these bands there is plenty of scope for more operating from Macao! Look out for a Japanese DXpedition to Macao for August 10th to 20th approximately.

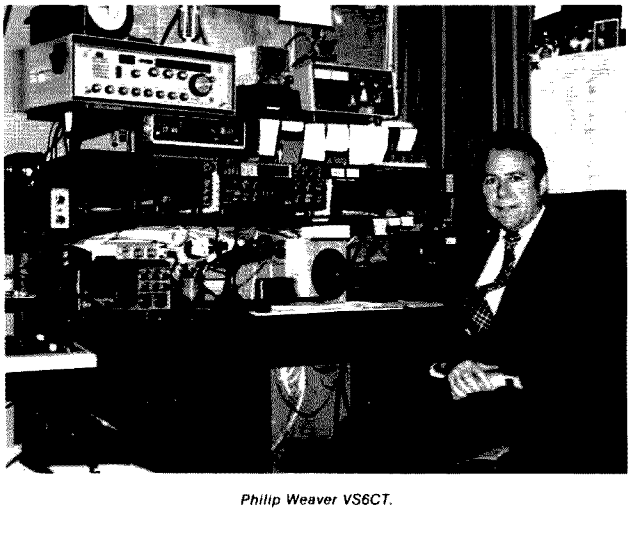
Interestingly enough, at this writing, nearly two months after the event, I have received only just over 700 QSLs. From this I am afraid that a lot of people will be sending their cards to a nonexistent QSL bureau. As is usual, they probably will end up in the Hong Kong Bureau. Although I am a member of HARTS, I can hardly inflict my outgoing CR9 cards on them. What it really amounts to is that education is needed by amateurs working DXpeditions. All have expenses such as transportation, hotels, QSL cards, and repairs to any equipment, in my case, to the borrowed linear.

So there are considerable outgoings which hopefully can be partly offset by incoming QSL cards with return envelopes and postage. Thanks to American amateurs who normally enclose a "green stamp" and Australians a "brown stamp," I shall just about break even, but what do I do with all those cards sent via the bureau? Two percent of the cards received direct have no envelope or return postage. I have actually spoken since to several of these latter stations, and without exception they have subsequently sent envelopes and postage. They had in every case just not thought about the problems at the other end.

I have, working as VS6CT over the last three years, made over 40,000 QSOs, and because of the problems with QSLing, established two QSL Managers—one in Japan (JA4ENL) and the other in England. If I had not done so, it would have brought into play the law of diminishing returns, for as the cards rolled in I would have spent less time on the air whilst filling them in. So what do you, the reader, want? If you want that VS6 or, for that matter, any rare card for your DXCC, please expect any rare DX station to have managers and always send a self-addressed enve-



Cliff SV1JG at his QTH.



Philip Weaver VS6CT.

lope with either 2 or 3 IRCs or a "green stamp."

One other aspect of operating from a fairly rare one is the different way one has to deal with the pileups. The Japanese are superb; you nave to call only one or two letters or work by prefixes and all others keep quiet until you have worked that station; they seem to know instinctively that more people can and will be worked that way. When working Japanese by prefixes I have worked 5 a minute, but that's quite hard going. Europeans never seem to learn, and the only way I have found to work them is by call areas, but still you get the breakers: "QRZ," "how about 3," "what's your QSL information," etc., instead of spending five or ten minutes listening.

Americans now seem very happy to work the last letter of their call, which I believe was introduced by "Uncle Bill" W7PHO on the family hour. This works extremely well, and I have found a very satisfactory rate of QSOs achievable this way.

73 and good hunting.

INDIA

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India

ACTIVE AMATEURS OF INDIA

Indian amateurs have been doing lots of active work, like providing emergency communication at Morvi where a dam gave way killing lots of people, helping every year the Himalayan motor-car rally which starts from New Delhi and goes up to 16,000 feet on the Himalayan Mountains, and providing the only line of communication in Gujarat and Andhra Pradesh which gets hit very often by cyclones and very heavy rains and floods.

After watching what the amateur-radio operators of India are doing for the public, our government started taking interest in our world-famous hobby and has taken a very bold step I think no government in this world ever has.

On March 17, 1984, when Indians celebrate the Holi Festival days by throwing different color dyes on each other, our government made amateur-radio operators' lives more colorful by waiving custom duty for wireless apparatus, accessories, and components, when imported by a licensed radio-amateur operator, up to a value limit of Rs.10,000 (US$1000) in a financial year, per license, subject to certain conditions. A red-letter day not only in the history of Indian amateurs but also for hams 'round the world.

We Indian hams do know that we are short of foreign exchange, but still our government values services given by us. I hope that all my brother and sister hams will keep up the good standard of hamming in India and will not act in any way which will make our government think of us in a different way next year when the new import policy is made.

Amateur radio is coming up very rapidly in India due to the hard work of our educational groups which are sparing no effort in running classes free of any charges for amateur radio. In India we have a science center in most of the states which have enough space and means to run such classes.

In Bombay we have the well-known Nehru Science Center which has run ham classes since April, 1978, and lots of students from local schools as well as working and elder people from all classes of life have taken advantage of it. One of them was Commander Mody who is 75 years old and has just gotten his license. The classes are held in Bombay twice a week, where I take Morse code and VU2MPN takes theory. It takes about 20 weeks to get one ready for a Grade 2 exam (which is a Novice exam) where the student has to copy Morse code at 5 wpm and have a little knowledge of electronics. Once the student gets his Grade 2 license, he goes on the air on CW on all the bands and gets some good hams who help him to increase his Morse speed up to 12 wpm. Then with a little more theory, he goes for his Grade 1 exam.

There are many active clubs in India that take keen interest in getting students ready for ham exams. To name a few: the Amateur Radio Society of India in Delhi, the Radio Electronic Society of India (Bombay), the Bangalore Amateur Radio Club, and the Andhra Pradesh Amateur Radio Society.

Indian hams are made up not only of OMs, but YLs and XYLs also. They are doing quite a lot of DXing and it brings a little QRM into the OM life as some OMs have to cook their own breakfasts when the XYL is having her sked with another OM; it's also interesting when an OM has a bedroom shack and has a QSO with some YL and has to answer a question like, "What is this woman doing on the air so late in the night?" Hi. The poor XYL may not be knowing that the YL with whom her OM is talking is far away in W-land and it is 0800 local time! Hi.

It would be a grand idea if the YLs/XYLs would start a "kitchen net" and start exchanging good recipes. After the net, the YL/XYL could run into the kitchen to try the new dish and the OM could operate on the band without any XYL QRM.

There are many XYL/OM teams coming up here and some of the famous are VU2FC/CP, VU2KT/WW, VU2GI/UGI, VU2NNN/NYL, VU2MY/MYL, VU2GDG/his XYL/his daughter, and VU2DVP/CVP. These are just a few, as every day new ones are coming up.

Now slowly our hams are getting maritime mobile licenses, and there are a few operating from ships: VU2KZ, VU2UDD, VU2HSL, VU2LNN, and VU2FMB, and it is fun talking to our own boys from DX land.

There are very few hams on RTTY—at the moment, just two: VU2VIM (OM Vimal) and myself. Now that the import is allowed, we may find more hams coming up on this mode.

On OSCAR there is some work done by one, VU2RM, and he put India on the map of satellite communication. I was also doing my best as AMSAT area coordinator, but we are not able to work OSCAR 10 as we are not allowed to transmit on 70 cm, but we are now awaiting the license and I am sure very soon Indian hams will be on OSCAR 10.

Last but not least, the permission to operate the VU7 from Lakshdeep came as a surprise to all the hams over the world, and three groups operated for 15 days at a time. The last group led by VU2GDG did a wonderful job and I think now hams 'round the world have worked VU7 on all the five bands.

I am sure with all the encouragement given by our government now, India will not be a rare station in the world and there will not be more complaints that Indian hams are bad QSLers as now we have another QSL bureau which is run by me on behalf of the Federation of Amateur Radio Societies of India via Post Box 6538, Bombay 400026, India. This bureau is giving service to each and every ham 'round the world free of any charges. All expenses for running the bureau have been covered by the Federation for the last 15 years. I am real happy when I hear that now hams all over are having no problems in getting Indian QSLs; it gives me real pleasure that my work for the last 15 years was useful to everybody. I am very thankful my Federation has given me cooperation in running the bureau.

ISRAEL

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Kibbutz Urim
Negev Mobile Post Office 85530
Israel

THE ASERET HAMFEST

For the past 35 years of its history, the Israel Amateur Radio Club has held only one national get-together a year—the annual general membership assembly of the association. Israeli law stipulates that all registered nonprofit organizations must have one such meeting a year to elect officers, and the declared purpose of the IARC annual assembly was to fulfill the letter of the law.

Over the years, our national association has grown from a handful of hams to over 700 members. In fact, the yearly meeting grew into a full-fledged convention squashed into one evening. It was no secret that most hams came primarily for the social get-together and the raffle of donated equipment, with the running of our organization being only an afterthought.

Last year it was decided to delete the raffle in order to give more time to the open "political" discussion and election of the executive. Needless to say, attendance dropped, and a past treasurer protested that the club's coffers had lost important revenue. The special-events committee met, and it was decided to try something new—a totally social event, a hamfest devoid of club politics, devoted entirely to enjoyment!

Thus, on Tuesday evening, March 27th, we gathered together at the community center of Aseret, a rural community half-an-hour's drive south from Tel Aviv. Amateurs came from as far away as Eilat on the Red Sea and the northern Galilee. There were visitors from the States, and the most exotic DX was a couple from the Philippines! For us all it was a great opportunity to make eyeball contact with those who up till then had been only voices coming forth from the loudspeaker.

Here in Israel no event is complete without opening speeches, but thankfully they were short and to the point. Aharon 4X4AT, IARC president, opened the program and thanked the various firms and individuals who donated prizes for the draw. 4X4GE of Motorola announced that his company was giving us space in one of their sites for our two-meter RTTY repeater. And the chief officer of the Israel Defense Forces' Signal Corps praised the technical perfectionism of the radio amateurs and hinted that surplus gear would continue to come our way.

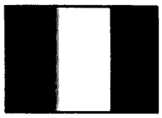
A fine and ample buffet, prepared by some of the amateurs and members of their families, ensured that no one went hungry and left early in search of a restaurant. Indeed, of all the IARC affairs I ever attended, this one had the best food! A program of entertainment with audience participation took place, although your scribe must confess that he took advantage of this time to meet with more hams.

The closing event was the long-awaited raffle. During the course of the evening, several volunteers had been going around hawking tickets at the shekel equivalent of a dollar fifty each. Our treasurer announced that we were now approximately two thousand dollars richer (or poorer, depending on how you look at it).

Prizes ranged from swr and power meters, mobile antennas, surplus "junk," and test equipment to a brand-new Lynx personal computer. There also were packages of cosmetics and artistic items for the ladies, and one gaudy statuette of a mermaid which was dubbed by Yankele 4X4AH, presiding over the draw, as an original microphone stand! Tickets continued to be pulled out of the bin, and a few "winners" failed to come forward to claim their boat-anchor Motorola D43GGV VHF transceivers which less than a decade ago were the mainstay of two meters in Israel.

The tension rose to its peak as the winning ticket was drawn for the microcomputer. I later learned that our lucky winner had bought no fewer than twenty-five tickets and had picked up a few other prizes in the process!

After saying good night to each other and thanking the organizers of the evening, we headed for the parking lot and began making our way back to our respective locations. No doubt, the Aseret hamfest had been an overwhelming success. Virtually all agreed that there's no need to wait a whole year before doing it again. Now, what remains to be seen, after all this, is what will be the nature of the upcoming general assembly of the IARC membership!



ITALY

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One of the most enchanting tourist resorts in Sicily, the small town of Cefalu located near Palermo, hosted this year, April 8-13, the International Amateur Radio Region I Conference.

The honorary and practical task of organizing the event was undertaken by Associazione Radioamatori Italiani (ARI), and many important administrative and government agencies, recognizing the importance of amateur radio, gave their effective aid. Among them were the Sicily regional government, the official tourist agencies of Palermo, Trapani, Cefalu, Termini Imeresa, and Castelvetrano, and the Bank of Sicily and Fiat.

The special prefix IT84 was issued to all Sicilian ham stations, and during the conference the ARI official station worked from Cefalu with the call IP9IARU.

The meetings were held at the Hotel Club Costa Verde, a big and futuristic holiday center which hosted also the delegates of the Region I associations and all the guests attending the conference.

It is very important to note that such an important conference took place in Italy, a country where amateur radio recently suffered heavy attacks, as the readers already know. ARI and the associated groups promoted widespread publicity (state television, RAI, transmitted a spot on the event in the Telegiornale, the most popular news transmission) and obtained attendance by the Republic President,

Pertini, and by the Ministero Poste e Telecomunicazioni (MPT), the very same telecommunications administration which had been accused of being an enemy of amateur radio!

Moreover, the highest officials of the MPT, in the persons of the General Manager, Dr. Monaco, and the Central Director of the Radio Services, Dr. D'Arnore, attended the opening and declared officially the Italian government's goodwill toward the Amateur Radio Service.

At the conference was an important group of observers including the IARU president, W1RU, the ARRL president, W4RA, and the JARL president and secretary who represented IARU Region 3. For the first time in amateur-radio history, three European Ministries of Telecommunications, West Germany, the Netherlands, and Italy, had their technical observers officially attending the conference.

All this represents a further step ahead in the campaign of the amateur community to support the IARU with the primary intent of promoting our activities and defending our interests against the increasing appetites of other services. The presence of three official state observers, moreover, is evidence of an increased concern of the states as far as the cultural, technical, and social importance of our service is concerned.

Beyond the technical conclusions of the conference, it is paramount to underline the political importance of the above-noted presences of officials. It means that radio amateurs have obtained respectability and fair contractual power for discussing problems and needs and sustaining their rights and privileges. This power shall be enhanced with the good behavior of every one of us, operating our own radios, working for technical progress and for the social welfare, and supporting our associations. In fact, "association" means union of efforts and thus means power.

At the conference were present 32 associations—Algeria, Andorra, Austria, Belgium, Czechoslovakia, Denmark, Finland, France, West Germany, East Germany, Jordan, United Kingdom, Ireland, Israel, Italy, Liberia, Luxemburg, Malta, Monaco, Nigeria, Norway, the Netherlands, Oman, Poland, S. Marino, Sierra Leone, Spain, South Africa, Sweden, Switzerland, Hungary, and the USSR. Bahrain, Zimbabwe, and Djibouti sent proxies.

The technical work was carried out by three committees, A, B, and C, which issued at the end their recommendations, which will become official law for the self-governing amateurs in the IARU Region 1. Arguments with these recommendations are many, and I will try to recall only some of them.

Among the most important are the international beacon project, radio direction-finding activity, the promotion of amateur radio in developing countries, a common license project, piracy on amateur bands, standardizing of QSL cards, special callsigns and recommendation to limit their use, RTTY, AMTOR, and ASCII, bandplans, satellites, and 432-MHz repeaters' standard frequencies.

At the time of writing these lines, the situation hasn't changed much recently. The MPT has released the 160-meter band from 1.830 to 1.850 kHz (100 W out maximum) and the two higher new WARC bands and has given authorization to use 10 Watts on 144 MHz and up for mobile use. No resolution yet of the other controversial points: 3.5-MHz band, 10-MHz band, and the repeaters. Although the Post and Telecommunications Ministry has clearly demonstrated a much softer position toward amateurs' problems, it seems at present to be unable to move further. Bureaucratic obstacles seem to be stronger than the political will. It should also be considered that when the old law ruling radio amateurs was issued, that law ruled tightly many technical areas which, when updated, become quickly "illegal." So, as a law can be modified only by another law and due to the fact that in Italy a law often takes twenty or thirty years to be issued, the MPT is faced with the problem of satisfying the needs of amateurs by twisting amendments between the law lines.

Some conference observers: from the right, the JARL president, the ARRL president, the secretary, Region 2 (Colombia), the JARL secretary, and the ARI president.

In particular, as far as the repeater operation is concerned, the MPT understands that it is foolish to forbid a kind of operation which is of paramount importance in case of emergency, but bureaucracy says that any kind of repeater should pay a considerable annual tax (as a substitute for a land line); the tax amounts to some thousands of bucks per year—well beyond the ham's possibilities.

On the 3.5-MHz band problem, it appears clear that the MPT has already assigned parts and channels to other government agencies and seems unable to cancel these allocations without losing face; it offers to amateurs only 100 kHz. The amateurs oppose that mutilation of a band assigned to their service by ITU. On the same principles, the MPT offers amateurs only 10 kHz of the new 10-MHz WARC band, stating that on that band our service is only secondary and that in any case they should have the OK from the Defense Ministry. This reinforces the opinion that in the period when amateurs were neglected, the MPT let the military take the lion's part on this band and now they are unable to turn back.

LIBERIA

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Two hundred twenty-five inches of rain! That is a lot of rain for one year. It does not rain in January or February, but it gets very hot and then there is the Harmatan. The Harmatan is an atmosphere of fine dust that blows across Liberia from the Sahara Desert. It clouds the sky to an altitude of over forty thousand feet, and here on Earth it covers everything inside the house and out. I draped a heavy cloth over my radio equipment, but it did not escape. The dust did its job. It got into everything.

Here along the ocean (Monrovia is situated right on the shore of the Atlantic), we have salt spray all the time, but during the Harmatan season, the salt spray mixes with the dust and makes a grimy coating that covers all antennas, ground lines, coax cables, and anything else that is exposed to the outside air. When you turn on your radio, you find that the swr is up and the line noises are at a level that will curl your hair. I have a fourteen-thousand-volt power line passing about a hundred yards behind my TA-33 when it is pointed toward the States. The line noises go up to S8 and S9. I am not completely sure whether the blame should go to the salt spray-Harmatan combination or to the power line. Chances are that it is a combination of both. In any case, I do know that in March, when the rains begin, the frying, crackling noises go to zero.

Here in this part of Liberia we are dependent on hydroelectric generators for a great part of our power. As the dry season gets under way, the first thing we know the gates have to be closed to conserve water for the city supply; then the electrical power has to be rationed. We can use candles for light, but they will not power the radio, so we grief-stricken amateurs have another headache. A few of the stations operate on battery power, but that is another area that has its troubles.

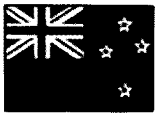
The ionosphere has to get into the act, too. At least so it seems. During February I missed all my schedules. When there *was* power, the bands were so dead that one was lucky if he heard even one Brazilian station. Brazil has a direct line into West Africa. They are always there with signal strength that can override anything. Once in a while a station from England or Sweden will squeak through, but the United States might just as well not exist. I seldom operate at night, which here in Liberia would mean after seventeen or eighteen hundred Zulu. It may be that the night people working twenty meters fare better. Really, I don't think they fare much better.

Sometimes we get one or two heavy rains in March. The antennas get washed, the air becomes clear (one can actually see the shape of the sun), and if the ionosphere is there, the radio comes to life and one can communicate. In March, however, the respite is brief. The month is dry for the most part. In April it rains a little more. There will be an average accumulation of eleven inches. The electric company turns on one of its turbines and the antennas stay clean a bit longer. In May it gets down to serious raining and will run an average of twenty-five inches.

Please understand that all this is happening in Monrovia. Twenty-five miles out of the city in any direction, or even less than that, this whole situation would change. There would be no salt spray, the rainfall could be drastically different, and there might be no electric power at all.

In the data that I have gathered over a bit more than three years, June takes the cake. My records show an average of fifty inches for the month of June! July, August, and September will run about thirty inches each, and then the rains drop off with October (twenty inches) and September (fifteen). December is dry. It might accidentally rain in December, but it must be listed as a dry month.

I have found it very interesting to observe these happenings. While this can in no way pretend to be scientific, it has been fun to compile data, make charts, and compare records. I have no notable observations concerning radio communication during the times that the rains are very heavy. It is true that there are frequent periods of clear air and sunshine. It seldom rains continuously for more than a day. For the most part, radio communication is good and the amateurs walk around with smiles on their faces. Even people who are not amateurs smile. They like the rainy season, too. It is cooler.



NEW ZEALAND

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SOUTHLAND FLOOD DISASTER

January in ZL-land is the middle of summer. Wednesday, January 25, was a fine hot day in Invercargill, the southernmost city in New Zealand, and all was well in the first week back at work after the summer holidays. The rain started at midnight, and on Thursday morning it was still raining. Nothing very unusual about that.

What was unusual was that the rain was to continue without slackening throughout the day. By 2100 hours NZST Thursday night, the Fire Service was involved in pumping water from flooded buildings and streets were being closed because of rising water levels, but so far the creeks and rivers were still within their banks. The flooding at that time was caused by an overloaded stormwater system. At 2315 it was still raining, and it seemed likely that those involved with Invercargill's Emergency Services would not get a full night's sleep.

At about 0315 hours, Friday the 27th, the AREC (Amateur Radio Emergency Corps) and Civil Defense Communications Leader, Neville Checketts ZL4OX, was summoned to CD HQ because a dec-

Continued on page 106

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AMTOR How-To

FEC? ARQ? Don't panic. Timely advice from the father of AMTOR takes the confusion out of our newest mode.

The following text is from a letter to W2JUP from Peter Martinez G3PLX, dated 9/24/83, on the subject of AMTOR operating practices. This information is reproduced by express permission of the author and is offered as a guide to AMTOR operating rules, as suggested by the one man most responsible for bringing AMTOR into the amateur-radio fraternity. Newcomers to the AMTOR mode are invited to give serious consideration to the ideas presented here and to add these sections to whatever AMTOR equipment operating manuals they may have.

Here are some thoughts on the subject of operating rules, etc., for AMTOR. They are in no particular order and are written down exactly as they occurred to me as I sat in front of the typewriter. They represent aspects of AMTOR operating that have given rise to problems so far over here and some (the hot QSY technique) which have been invented to complement the advantages of AMTOR.

1. Legalities

Establish before operating whether you are authorized to do so. Most countries where there is currently AMTOR activity permit it by general license regulations. Some countries require the licensee to apply for a special permit. Some countries do not permit AMTOR. In others, stations are active.

2. Getting Started

The most popular AMTOR mode is ARQ, since it is the most effective. However, do not attempt to make the first QSOs on ARQ until FEC has been tested and is known to be working. If there is a fault in part of the system, no contact will result on ARQ at all, whereas at least if one direction (transmit or receive) is working, faults can be identified and cured with contact in FEC. The following step-by-step procedure will assist in finding faults during commission of a new AMTOR station.

2.1. Check FEC receive first, with a known distant station sending in the correct shift-polarity. This will confirm that the station receiver is working and in the correct shift-polarity.

2.2. Check FEC transmit next, asking a distant receiving station to confirm that the transmit shift-polarity is correct.

2.3. Make a short transmission with an ARQ call, asking the distant station to use "listen" or "monitor" mode to check that the transmitter keying is functioning correctly. The most common fault at this stage is a too-slow changeover from receive to transmit, resulting in missing transmitted data at the start of the burst. Some AMTOR units have a delay adjust which may allow slow transmitters to be used successfully except for very long distance contacts. Some remedial work may be required on the radio if this test fails.

2.4. If 2.3 is successful, ask the distant station to make an ARQ call to your selcal. Your station should respond and an ARQ contact should result.

2.5. Finally, make an ARQ call to the distant station and attempt an ARQ contact with your station as master rather than, as in 2.1, as a slave.

If no contact results yet the distant station indicates that he was replying to the call, then the problem is that the radio is too slow to change from transmit to receive. Remedial work may be required to correct this: No adjustment to the "delay" preset in the AMTOR unit, if fitted, will cure this problem. Consult the supplier of your radio if remedial work is needed. It is important to follow these steps in order. Unnecessary confusion, frustration, and interference can result from a premature attempt to start an ARQ contact where the complete contact cannot be made until all the component parts are working correctly.

3. Operating Techniques

AMTOR is sufficiently different from other modes that some of the operating practices traditionally used on the air are no longer appropriate, and some new techniques peculiar to AMTOR need explaining.

3.1. FEC and ARQ. When to use them. ARQ is well known to be the better of the two, but there are several situations where FEC has its advantages and some where its use is essential.

3.1.1. Use ARQ for all two-way contacts.

3.1.2. Use FEC for all multi-way contacts.

3.1.3. Do not use ARQ for CQ calls. There are several reasons for this:

3.1.3.1. Listeners cannot identify the calling station in an ARQ CQ call. Thus, they either must risk replying to a station with whom contact was not desirable or suffer the embarrassment of having to terminate a contact if, for example, it turns out to

be the station you have just worked.

3.1.3.2. If a contact which resulted from a CQ call on ARQ subsequently runs into a rephrase attempt, the resultant CQ call from the master station may attract a completely new reply from a third station, thus resulting in this new station "stealing" the contact.

3.1.4. FEC will have to be used if the distance between the two stations is longer than about 22,000 miles, such as in "long-path" contacts which travel more than halfway round the globe or some high-orbit satellite contacts. Make sure you know in advance if the path you are attempting is in this category, and do not attempt ARQ under these conditions; it is very frustrating to be called on ARQ when it is known that the path is too long and very difficult to attract the attention of the caller to the problem.

3.2. Starting an AMTOR QSO.

There is no need to explain how to start an FEC QSO since the technique is identical to that of other modes. However, since in ARQ mode it is necessary to know the other station's selcal code before calling him, a new technique must sometimes be required.

3.2.1. If the other station's selcal code is already known, as in the case of a "sked," then there is no problem. Simply enter the required selcal code to the AMTOR unit, and if/when the desired station is on frequency, he will reply and the contact can proceed.

3.2.2. If tail-ending on a previous contact and the intention is to call one station on ARQ and his selcal code is not known, then there are two ways to proceed:

3.2.2.1. There is a convention in operating amongst AMTOR operators with respect to the way to choose the station selcal code from the station callsign. This is to choose the first letter of the callsign followed by the last three letters, ignoring completely any figures. In the case of a callsign with only three letters altogether, the first letter is repeated twice. This ruse breaks down for callsigns in which the prefix contains figures. However, if the callsign of the desired station can be translated into a selcal code in this way, then use the selcal code to call him after he signs off with the station he is working.

3.2.2.2. If his callsign cannot be encoded in the above way or his callsign is now known or he does not respond to the expected selcal code, then call him in FEC mode, giving him the choice of calling you back on your selcal code or asking him to tell you what selcal code he is using. Note that some stations who may be using commercial SITOR-type units may not always be able to make ARQ calls to all possible combinations of letters in a selcal and thus may require that you call them, often with a selcal code that bears no relationship to their callsign, being in fact a translation from a telex number associated with the commercial equipment.

3.2.3. To make a CQ call to start an AMTOR QSO, do so on FEC mode, mentioning your own selcal code so that at the end of your call, a prospective QSO partner can call you back directly with your selcal. If you are expecting replies only on FEC (for example, for contacts via a long path), mention this fact in the CQ call.

3.3. Operating techniques whilst in contact in FEC.

Whilst operation in FEC is very similar indeed to that of conventional RTTY, there are two points to note, however, both related to the method by which the FEC receiver synchronizes the distant transmitter:

3.3.1. Since the receiver can only synchronize to the transmitter when it is not sending traffic (that is, idling), each transmission must start with a period of idling. Most AMTOR units will ensure that a short period of idle precedes the typed message, but under poor conditions or where it may help the distant receiving station to tune in, extra periods of idle will help, both at the beginning of the transmission and also at periods during the transmission, in case interference may have resulted in the distant receiver losing synchronization.

Note that the practice common on conventional RTTY of transmitting a line of test message or RYRYRY to allow the distant station to tune in is actually counterproductive on FEC, since the distant receiver will not synchronize until the end of this test sequence and the idle signal itself is quite suitable for tuning purposes.

3.3.2. Some commercial SITOR-type units require a received FEC transmission to start with a carriage return and/or a line-feed signal. For this reason, and also to aid the formatting of any distant printer copy, always start an FEC transmission on a new line.

3.4. Operating techniques on ARQ mode.

3.4.1. Transmitter and receiver tuning.

An ARQ contact always starts with the master station making the initial call and the slave replying. Thus the frequency will have been chosen by the master station, and the slave station will have "netted" onto that. It often happens that an offset at either station will then result in the signal from the slave received at the master being a bit off tune. If the master station then readjusts his transceiver's main tuning dial to remedy this error, he will also offset his transmitter, probably putting his signal off tune in the distant slave's receiver. A never-ending series of readjustments can then take place.

The equivalent problem on other modes rarely causes trouble since the retune operations only take place each time the transmission is passed from one station to the other. However, with the "quick-break" operation of ARQ, such offsets can cause trouble. Thus a convention has been adopted among AMTOR operators to prevent this situation arising. This convention is that the master station must at all times keep his transmitter frequency constant. Thus if the master finds that the slave signal is not correctly tuned, he must adjust only his receiver frequency to remove the error, leaving his transmitter frequency untouched, by the use of the RIT control on the transceiver. The slave station, on the other hand, may, if he finds his receiver off tune, make a correction by adjusting both receiver and transmitter frequencies together by means of the main tuning dial. This convention prevents any offset from accumulating and is the frequency-domain analogue to the time-domain synchronization in which the master-station clock determines the phasing for the contact.

3.4.2. Changing frequency during an ARQ QSO.

Since both stations are "listening through," if there is some interference on the frequency or if a change of frequency is desirable for some other reason (for example, to clear a calling frequency), then both stations may wish to move together to another frequency. Whilst at first there may seem to be no reason to discuss such a simple operation, which is very common and easy to perform on any other mode, there are problems if a QSY is made in some ways in ARQ, and there are advantages in adopting a specific technique.

3.4.2.1. The easiest way of QSYing an ARQ QSO is to close down and restart it again on a new frequency, with the master station choosing the new frequency. This is referred to in AMTOR circles as a "cold" QSY. This technique is the preferred one when moving off a calling frequency and in other conditions where there is good copy between stations, so that an orderly close-down and start-up is anticipated.

3.4.2.2. If, however, the QSY is desired because of interference, then another technique is possible; if carried out in the right way, it can have decided advantages, but if carried out wrongly, it can cause problems and offense to other band users. This is referred to as the "hot" QSY technique.

In this, the master station, while in the rephasing mode, moves off the old frequency to the new one, and the slave then follows.

It is important, while the master station is doing this, for him to prevent his transmitter from radiating in order to prevent unintentional interference to other band users and also to disable the connection between the receiver and the AMTOR (in order to prevent unintentional "phantom sync" to any other ARQ signals which may be audible during the search for a new frequency). Such phantom sync will result in spillage of traffic from the QSO in progress, from the other QSO, or both. It can only be the master station that leads in a hot QSY. If the slave station were to attempt to lead a QSY, then, in the event that it was not successfully completed before the contact timed-out into a rephase operation, the slave would no longer be transmitting, and there would be no way for the slave to establish a new frequency without restarting as a master and thus losing some traffic.

3.4.3. Fixed-channel working.

Since it is possible to leave an AMTOR station in "standby" mode on a channel and for any other station to make a specific call to that station, a common practice in AMTOR is to monitor such a specific frequency. The question arises as to what exactly is the "frequency" of an AMTOR emission. There are, unfortunately, two different conventions in use; one more commonly used in amateur circles, and the other used universally by all non-amateur users.

3.4.3.1. The "amateur" convention says that an AMTOR signal (and indeed any FSK signal) is specified with reference to the frequency of the higher frequency tone in the pair. Thus, if a sked, for example, is prearranged to occur on 14,075 kHz, this is taken to mean that the two transmitted tones are on 14,075.00 and 14,074.83 kHz.

3.4.3.2. The "commercial" convention, also used increasingly by amateurs, says that the signal is specified with respect to the frequency of the imaginary center channel. Thus a signal said to be on 21,100 kHz will have one tone on 21,099.915 kHz and the other on 21,100.085 kHz, that is, 85 Hz either side of the nominal, rather than with one tone on and the other tone 170 Hz below the nominal. Note that it is assumed that the frequency shift is universally accepted to be 170 Hz.

Thus, in any specification of a "frequency" in connection with AMTOR working, due regard must be taken of the convention intended, at least until such time as one of these conventions is dropped in favor of the other.

Another factor is significant with respect to setting frequencies on the dials of SSB transceivers used on AMTOR with audio-freqency shift tones used. Since the tones will result in transmissions offset from the suppressed carrier frequency, the dial, which normally indicates the suppressed carrier frequency, will not read correctly. It will be necessary to add or subtract a fixed amount to the dial frequency in order to establish the actual frequency in use. For example, if the transceiver is in use on lower sideband, with audio-tone frequencies of 2125 and 2295 Hz, then, to operate on an "amateur" frequency of 14,075, the transceiver dial must be set to 14,077.125, that is, 2.125 kHz higher than the desired freqency. The two radiated tones will then be on 14,077.125 − 2.125 (14,075) and 14,077.125 − 2.295 (14,074.83). Other offsets must be used if a "commercial" channel is to be set up (2.210 kHz), and the offset will be in the other direction if upper sideband is to be used in the transceiver. The offset must be recalculated if the tone frequencies are different from those quoted.

Users of transceivers with an FSK connection must consult the transceiver handbook or supplier to establish if an offset has to be applied to the dial frequency. Even if the transceiver supplier indicates that no offset is needed, it will be necessary to establish if the "amateur" or "commercial" convention is implied or some other convention.

3.4.4. Use of the "over" or "break-in" facility.

In ARQ mode, it is possible, by use of the "over" or "break-in" facility, to interrupt the sending of the other station. This facility should be used with care and only in situations where it is essential to do so. The reason is that there are inherent reasons why recovery from such an interruption can result in garbled copy at one end of the contact, in particular in "figs" garble. If possible, wait until the other station is idling before breaking in, and if the other station breaks into your transmission, it will probably help to use the "clear buffer" facility, if such exists, to abort the later transmission of any unsent text which would be inappropriate to the new context of the break-in.

3.4.5. The AMTOR alphabet, like the RTTY alphabet, consists of two sets of 30 characters, with a switch made between them by two "shift" or "case" codes. One inherent result of this technique is that it is often not known which shift the distant receiving station is in at the commencement of the contact. For this reason, it is always good practice to send the appropriate shift code at the start of each contact, and indeed, at the start of each message and perhaps at more frequent intervals. With terminals encoded in teleprinter code, there are always two keys, labeled "letter" and "figures," and so it is simply necessary to hit the appropriate one of these keys as required.

However, on more modern terminals, these two keys may not exist, and the sending of the shift code may be hidden from the user. However, since the distant terminal could still nevertheless be in the wrong shift, there will always be the requirement to send the shift code at the start to prevent the distant receiver copying the first part of the text in the wrong shift. Consult the documentation with your AMTOR unit or terminal in order to establish how to do this if there is no "letters" or "figures" key.

4. Format of Selcal Code

Although the convention is to form the selcal from the callsign, some AMTOR units have the possibility to include any AMTOR character in the selcal. It is strongly recommended, however, that only the 26 letters A–Z are used in selcal codes.■

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Picture-Perfect Audio Filters

Throw away that antique breadboard and scope. Let your Apple II peak and tweak a soft circuit instead.

Active audio filters are amazing devices. They seem to be incredibly powerful yet wonderfully simple. I have marveled often at the way a handful of components can seemingly work magic on audio signals. Best of all, they can be an easy home-brew project.

Anyone who decides to design and build one of these gems will find a major stumbling block, however. It is very difficult to determine the true frequency response of the filters. In the past, I have used two methods to plot the response curve for my designs. One method was to use a calculator to work my way through some horrendous transfer functions and then graph the results. In order to get a useful graph, you must do the calculations for twenty or thirty frequency values. This method is an excellent way to wipe out several evenings or a weekend.

A second method is to breadboard the design and then go to work with a signal generator, oscilloscope, and graph paper. While this method is less tedious, it has many of its own problems, such as the accuracy of the test equipment and components used in the circuit. Now there is a third alternative for finding the frequency response of active filters. If you have access to an Apple II computer, you can use the program described in this article.

The program I wrote generates a graph of the frequency response of your own custom filter designs.

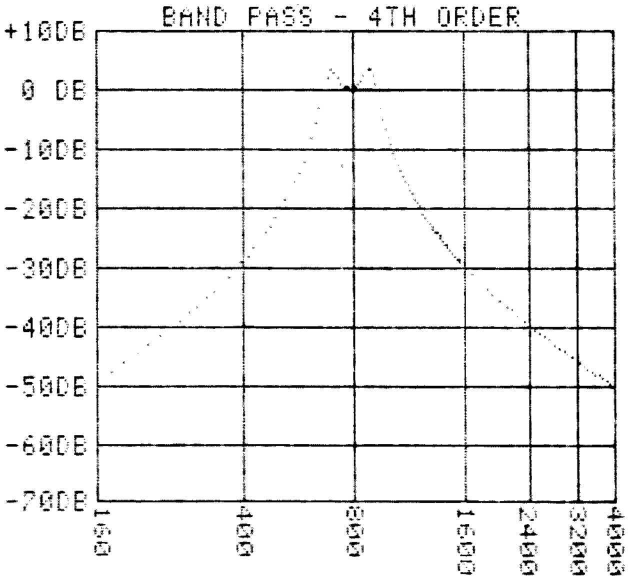

Fig. 1. Typical curve generated by the program. This is a two-section bandpass filter. The graph center frequency is 800 Hz and this was plotted in the wide mode.

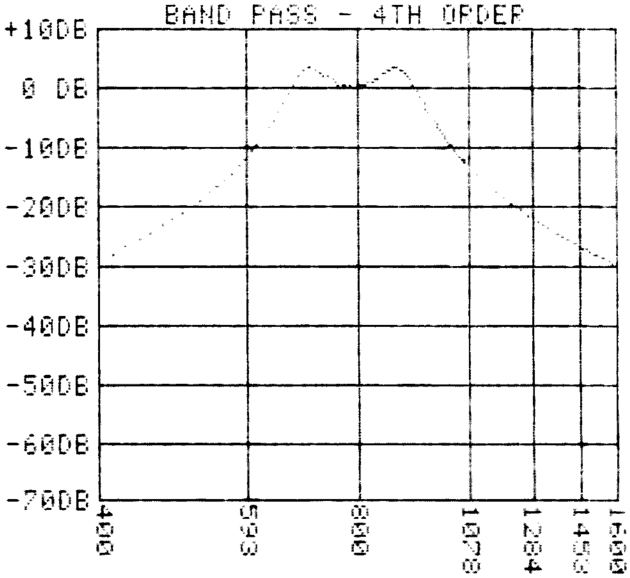

Fig. 2. The same graph as Fig. 1 but plotted in the narrow mode so that the central area can be examined. Note the horizontal frequency scale as compared to Fig. 1.

```
]        00 01 EF D8 00
*6000.6307

6000-  38 00 92 00 94 00 9B 00
6008-  A3 00 B5 00 C5 00 D2 00
6010-  E3 00 EB 00 F5 00 FF 00
6018-  0A 01 12 01 16 01 1B 01
6020-  1E 01 27 01 36 01 3E 01
6028-  4B 01 58 01 63 01 73 01
6030-  82 01 8E 01 9B 01 A6 01
6038-  A9 01 AD 01 B8 01 C0 01
6040-  CB 01 D5 01 E5 01 F2 01
6048-  FE 01 0B 02 17 02 23 02
6050-  2F 02 3C 02 49 02 52 02
6058-  5C 02 6B 02 75 02 81 02
6060-  8F 02 9E 02 A9 02 B6 02
6068-  C4 02 D2 02 DA 02 E8 02
6070-  F7 02 03 03 00 00 00 00
6078-  00 00 00 00 00 00 00 00
6080-  00 00 00 00 00 00 00 00
6088-  00 00 00 00 00 00 00 00
6090-  00 00 00 00 08 18 30 36
6098-  B6 04 00 08 18 18 36 0D
60A0-  24 04 00 08 18 18 36 36
60A8-  36 0D 24 24 24 95 1F 1F
60B0-  16 0D 0D 04 00 09 08 18
60B8-  3F BF 0E 2D D5 F1 3F 77
60C0-  21 20 20 20 00 08 18 18
60C8-  37 6D F1 1E 1E 1E 4D 35
60D0-  27 00 89 16 0F 18 0F 18
60D8-  0F 18 0F 18 64 15 B6 1B
60E0-  76 25 00 09 18 08 18 1E
60E8-  1E 04 00 64 0C 96 92 0F
60F0-  18 0F 18 04 00 E4 1C 96
60F8-  92 0D 18 0D 18 04 00 24
6100-  95 0D 18 16 1F FE 20 A8
6108-  04 00 24 96 6E 08 18 FF
6110-  27 00 32 1E 04 00 2B 2D
6118-  DF 23 00 92 04 00 08 18
6120-  48 F6 1E 1E 1E 26 00 0C
6128-  0C 1C 3F 17 36 2E 1E 0E
6130-  2D 0D 18 24 24 00 18 60
6138-  36 36 AE 3F 04 00 08 D8
6140-  63 2D 15 F6 1E 1E 1E 2D
6148-  2D 04 00 0C D8 63 2D 15
6150-  F6 0E F6 3F 0F 18 04 00
6158-  4A D6 24 24 24 1E 1E 1E
6160-  2E 25 00 09 08 18 38 3F
6168-  37 2E 2D 15 36 1E 3F 0F
6170-  18 04 00 09 08 18 18 BF
6178-  1E 2E 2D 15 F6 3F 0F 18
6180-  24 00 1B 08 18 2C 2D 35
6188-  1E 1E 1E 1E 26 00 3F 20
6190-  0C 2D 15 F6 0E F6 3F 0F
6198-  18 24 00 39 3F 20 0C 2D
61A0-  15 36 F6 1E 27 00 B0 04
61A8-  00 B0 1E 04 00 09 08 18
61B0-  B8 17 17 0E 0E 0E 04 00
61B8-  1B 28 2D B5 3F 3F 04 00
61C0-  1B 08 1B 70 0E 0E 1E 1E
61C8-  1E 04 00 08 D8 63 2D 15
61D0-  F6 1E 16 04 00 52 09 18
61D8-  24 E4 3F 17 36 36 0E 2D
61E0-  E5 38 24 25 00 2D 36 FE
61E8-  18 24 2C 1C 0C 0C 15 15
61F0-  04 00 3F 24 2C 2D 15 F6
61F8-  0E F6 3F 27 24 00 08 58
6200-  E1 3F 17 36 36 0E 2D 0D
6208-  18 04 00 1B 24 2C AD 15
6210-  36 1E 1E 3F 24 04 00 FD
6218-  27 24 2D 2D 96 92 3F 3F
6220-  24 04 00 39 27 08 58 09
6228-  3F 3F 36 36 36 04 00 CA
6230-  2D F6 3F 0F 18 24 24 0C
6238-  2D 15 04 00 2B 25 08 58
6240-  36 36 36 DF 23 24 24 24
6248-  00 24 3C 0D 96 1A 36 FD
6250-  04 00 08 18 28 F5 36 36
6258-  1E 3F 20 00 08 18 D8 36
6260-  36 36 4D 39 38 38 60 0C
6268-  0C 04 00 08 18 D8 36 36
6270-  36 2D 2D 04 00 64 0C 36
6278-  36 36 DF 23 24 24 AC 04
6280-  00 92 1B 24 24 24 95 0E
6288-  0E 56 24 24 24 04 00 08
6290-  18 38 17 36 36 0E 2D 0D
6298-  18 24 24 1C 04 00 92 1B
62A0-  24 24 24 2D AD F6 3F 04
62A8-  00 4A 24 E4 3F 17 36 36
62B0-  0E 6D 1C 1C 04 00 92 1B
62B8-  24 24 24 2D AD F6 3F 0E
62C0-  0E 0E 04 00 08 58 E1 3F
62C8-  17 76 2D 15 F6 3F 0F 18
62D0-  04 00 92 24 24 24 2D DF
62D8-  27 00 0B 18 08 D8 36 36
62E0-  76 2D 0D 18 24 24 24 00
62E8-  08 18 D8 36 36 0E 0E 0D
62F0-  18 0D 18 24 24 04 00 76
62F8-  0E 24 24 24 DF 33 36 36
6300-  2E 20 00 00 FF FF FF FF
```

Shapefile.

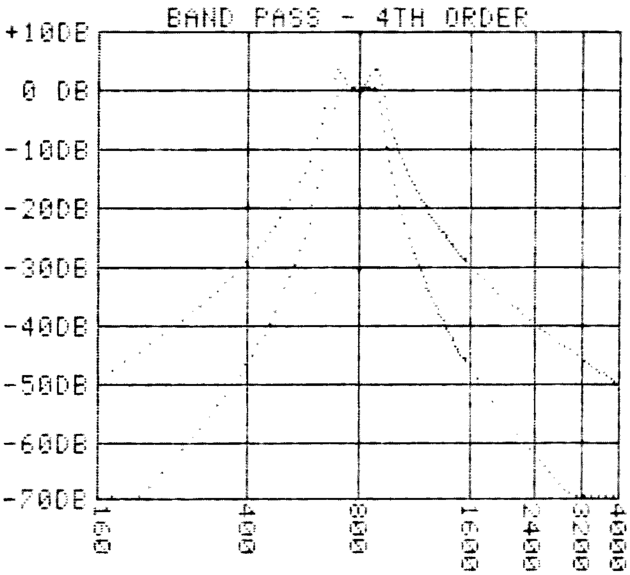

Fig. 3. The same graph as Fig. 1 but with a second filter curve plotted over the first using the overlay feature. The second graph is the same as the first with an additional section added to steepen the skirts and smooth the passband.

You input the cutoff frequency and Q of your design, and within seconds you get a graph for that exact filter. The graph shows the decibels of rejection as a function of frequency. The program can combine up to four cascaded filters and may be used for low-pass, bandpass, and high-pass designs. There are several other options that help make this a very powerful tool for those who enjoy tinkering with active filters.

The program uses the two HIRES screens in the Apple for the actual graphs. When you run the program, you will be presented with a menu where you select the type of filter in which you are interested (low-pass, bandpass, or high-pass). Next, you select the number of sections in your filter and then proceed to a data-input screen. This data-input screen is where you enter the various filter parameters for your filter and also select several graphing options. First you enter the center frequency, which is the frequency on which you want the graph centered. Next, you enter your filter's cutoff or center frequency and then its Q factor. If you are using a three-section filter, you enter the cutoff frequency and Q for each filter section.

After the filter information is entered, you are given several graphing options. First you select either a wide- or a narrow-frequency scale for the graph. The wide scale will generate a graph starting at 1/5th of the center frequency and ending at 5 times the center frequency. The narrow scale runs from half the center frequency to double the center frequency. As an example, if you select a center frequency of 1,000 Hz, then the frequency axis on the graph will go from 200 Hz to 5,000 Hz in wide mode and 500 Hz to 2000 Hz in the narrow mode. In both cases the graph will be centered on 1,000 Hz and will be logarithmic (see Figs. 1 and 2).

The second option is to select either HIRES page 1

✓ See List of Advertisers on page 98

or page 2. The last option available is the overlay mode. By selecting the overlay feature, you can have your graph plotted over a graph already in memory. This feature is especially useful for comparing two different filters (see Fig. 3). The third option also allows you to review any graphs already in memory. Using the review function also puts you back at the point where you select the three graphing options so that you can edit them before plotting the graph.

If you do use the review feature, you are presented with a new menu which lets you choose page 1 or page 2 simply by pushing the 1 or 2 key. You may toggle back and forth between the two in order to compare two graphs in memory. Pushing any other key will return you to the original menu. The review feature also is available from either of the first two menus.

Once you have opted for a new graph or an overlay, the program takes over and begins the plotting procedure. If you selected "new graph," then everything on the HIRES page you selected is erased and a new coordinate grid is calculated and drawn. If you selected "overlay," then the graph will be plotted over whatever graph and coordinate grid that is already in memory.

Next, the graph coordinates are calculated and plotted, and after the graph is drawn, you can return to the main menu by pressing any key. If you want to change the number of points that are plotted, then increase or decrease the STEP values in lines 1010 through 1090. I chose values which seem to give good trade-off between resolution of the graph and amount of time to plot the graph.

A few comments are in order concerning the graphs that are plotted. The equations in the program give the filter response as a ratio of voltages as opposed to current or power. The equations also give the theoretical response and do not allow for errors introduced by variations in component values or op amp limitations. As you increase the Q and number of sections in a filter, these items become more critical.

All of the coordinate grids display a range of 80 dB which converts to .5 dB for each screen pixel, which seems to be a reasonable resolution. You will find that the dB scale for the bandpass filters is different from the low-pass and high-pass. This was done to try to fit the maximum amount of information in the allotted room. The bandpass curves are set up so that the center frequency will always be 0 dB and all other points will be relative to it.

The low-pass is such that frequencies well below the cutoff frequency will be at 0 dB. High-pass is similar to low-pass, only it is frequencies above the cutoff frequency that are at 0 dB. This has been done by ad-

FILTER DESIGNER

```
]

1  GOTO 200
2 L =  LEN (P$): FOR J = 1 TO L: DRAW  ASC ( MID$ (P$,J,1)) - 31 AT X,Y:X =
     X + 7: NEXT : RETURN
3  IF PG% = 1 THEN PG% = 2: POKE  - 16304,0: POKE  - 16297,0: POKE  - 1630
     2,0: RETURN
4  IF PG% = 2 THEN PG% = 3: POKE  - 16299,0: POKE  - 16302,0: RETURN
5 PG% = 1: POKE  - 16300,0: POKE  - 16303,0: RETURN
6 X = 5: GOSUB 2: RETURN
10  IF Y1 = 97 THEN Y1 = 0: RETURN
15 Y1 = 0: FOR J = 1 TO O:F = FF * I ^ W / F(J):D = 1 / Q(J)
20 Y = 40 * ( LOG ((F ^ 4 + ((D ^ 2 - 2) * F ^ 2) + 1) ^ .5)) / A0:Y1 = Y1
     + Y: NEXT
25 X =  LOG (I * 50) / A0 * 150 - 110
30  IF Y1 > 97 THEN Y1 = 97
35  IF Y1 <  - 59 THEN Y1 =  - 59
40  HPLOT X,(Y1 + 68):K =  PEEK ( - 16336):K =  PEEK ( - 16336): RETURN
45  IF Y1 = 97 THEN Y1 = 0: RETURN
50 Y1 = 0: FOR J = 1 TO O:F = FF * I ^ W / F(J):D = 1 / Q(J)
55 Y = 40 * ( LOG (((1 / F ^ 4) + ((D ^ 2 - 2) / (F ^ 2)) + 1) ^ .5)) / A0
     :Y1 = Y1 + Y: NEXT
60 X =  LOG (I * 50) / A0 * 150 - 110
65  IF Y1 > 97 THEN Y1 = 97
70  IF Y1 <  - 59 THEN Y1 =  - 59
75  HPLOT X,(Y1 + 68):K =  PEEK ( - 16336):K =  PEEK ( - 16336): RETURN
80  IF Y1 = 138 THEN Y1 = 0: RETURN
85 Y1 = 0:Y = 1: FOR J = 1 TO O:F = FF * I ^ W / F(J):D = 1 / Q(J)
90 Q = Q(J):Y = Y * (((((F ^ 2 - 1) / F) ^ 2) * Q ^ 2 + 1) ^ .5): NEXT
95 Y1 = 40 * ( LOG (Y)) / A0: IF F% = 0 THEN G = Y1: RETURN
100 X =  LOG (I * 50) / A0 * 150 - 110:Y1 = Y1 - G
105  IF Y1 <  - 19 THEN Y1 =  - 19
110  IF Y1 > 138 THEN Y1 = 138
115  HPLOT X,(Y1 + 28):K =  PEEK ( - 16336):K =  PEEK ( - 16336): RETURN
200 P =  PEEK (233):A0 = 2.30258509:W$ = "W":W = 1: HCOLOR= 3: SCALE= 1:PG
     % = 1: DIM Q(5),F(5): IF P = 96 THEN 220
210  PRINT  CHR$ (4);"BLOAD FILTER SHAPEFILE,A$6000": HGR : HGR2 : TEXT : POKE
     232,0: POKE 233,96
220  HOME : PRINT "<<<<<<<<<<*********************>>>>>>>>>>"
230  HTAB 11: PRINT "ACTIVE AUDIO FILTERS": HTAB 16: PRINT "MAIN MENU"
240  VTAB 6: PRINT "<<<<<<<<<<<<<<<<**********>>>>>>>>>>>>>>>>"
250  VTAB 10: PRINT "LOW PASS ---------- 1": PRINT
260  PRINT "BAND PASS --------- 2": PRINT
270  PRINT "HIGH PASS --------- 3": PRINT
280  PRINT "EXAMINE GRAPHS ---- 4": PRINT
290  PRINT "END --------------- 5"
300  VTAB 21: HTAB 21: GET T$:T =  VAL (T$): VTAB 21: HTAB 21: PRINT T$
310  IF T = 1 THEN T$ = "LOW PASS ": GOTO 580
320  IF T = 2 THEN T$ = "BAND PASS": GOTO 580
330  IF T = 3 THEN T$ = "HIGH PASS": GOTO 580
340  IF T = 4 THEN  GOSUB 440: GOTO 220
350  IF T = 5 THEN  END
360  GOTO 300
370  PRINT "     >>> INPUT DESIRED RESPONSE <<< ": PRINT : PRINT
380  PRINT "2ND ORDER (1 SECTION) ------------- 2": PRINT
390  PRINT "4TH ORDER (2 SECTIONS) ------------ 4": PRINT
400  PRINT "6TH ORDER (3 SECTIONS) ------------ 6": PRINT
410  PRINT "8TH ORDER (4 SECTIONS) ------------ 8": PRINT
420  PRINT "EXAMINE CURRENT GRAPHS ------------ E": PRINT
430  PRINT "RETURN TO MENU -------------------- R": RETURN
440  HOME : VTAB 4: HTAB 8: PRINT "EXAMINE CURRENT GRAPHS": VTAB 8: PRINT
     "PAGE 1 ---------- 1": PRINT : PRINT "PAGE 2 ---------- 2": VTAB 16
     : HTAB 8: PRINT "RETURN - ANY OTHER KEY"
450  VTAB 12: HTAB 20: GET E$
460  IF E$ = "R" THEN  POKE  - 16300,0: POKE  - 16303,0: RETURN
470  IF E$ = "1" THEN  POKE  - 16302,0: POKE  - 16300,0: POKE  - 16304,0: POKE
      - 16297,0: GOTO 450
480  IF E$ = "2" THEN  POKE  - 16302,0: POKE  - 16299,0: POKE  - 16304,0: POKE
      - 16297,0: GOTO 450
490  POKE  - 16300,0: POKE  - 16303,0: RETURN
500  HPLOT 40,08 TO 250,08: HPLOT 40,28 TO 250,28: HPLOT 40,48 TO 250,48: HPLOT
     40,68 TO 250,68: HPLOT 40,88 TO 250,88: HPLOT 40,108 TO 250,108: HPLOT
     40,128 TO 250,128: HPLOT 40,148 TO 250,148: HPLOT 40,167 TO 250,167
510  HPLOT 40,08 TO 40,166: HPLOT 100,08 TO 100,166: HPLOT 145,08 TO 145,1
     66: HPLOT 190,08 TO 190,166: HPLOT 216,08 TO 216,166: HPLOT 235,08 TO
     235,166: HPLOT 250,08 TO 250,166
520  IF T = 2 THEN 540
530 Y = 08:P$ = "+30DB": GOSUB 6:Y = 28:P$ = "+20DB": GOSUB 6:Y = 48:P$ =
     "+10DB": GOSUB 6:Y = 68:P$ = " 0 DB": GOSUB 6:Y = 88:P$ = "-10DB": GOSUB
     6:Y = 108:P$ = "-20DB": GOSUB 6:Y = 128:P$ = "-30DB": GOSUB 6:Y = 148
```

justing the gain in the calculations to place the curve on the graph where it provides the maximum amount of information. In real life if you build a filter, you can select whatever gain you like and it will have the effect of moving the entire curve up or down the vertical axis.

The program is in two parts, an Applesoft program and a shapetable file. The Basic program is entered in the normal fashion with the exception of lines 500 through 550 which must be entered without any spaces in order for them to fit into the Apple's input buffer. The program is heavily dependent upon subroutines, and care should be taken when entering line numbers to avoid branching errors. The shapetable is entered as described in the *Apple Reference Manual*, Chapter 3. The shapetable should begin at $6000, and it has a length of $304. After it is entered, BSAVE it using the filename FILTER SHAPEFILE.

If you have a graphics printer, you can easily add a routine to print the graphs. Add a line 295 to put the printer selection on the main menu. Add line 355 to read "IF T=6 THEN 1200". Starting at line 1200 you would add the printer routines used by your printer to output graphics. After the printing is complete, have the program return to line 220, the beginning of the main-menu sequence. I have used this method with the Epson MX-80, and it works.

I have included error trapping for most of the input for this program so that it usually will ignore an incorrect entry. However, you may run into a situation where you have managed to sneak some illogical character into a calculation which causes the program to error. If this happens, enter "RESET" and "RUN". You will be back at the main menu and any graphs in memory will be maintained intact. If you do not want to enter the program by hand, it is available from me on diskette (DOS 3.3) for $12.00.

If you have an interest in active audio filters and have access to an Apple computer, I am certain that you will find this program fascinating. The graphing routine gives you a very powerful tool to assist in designing filters. With the touch of a few keys, you can see exactly what response you can expect from a given design and a totally new filter may be evaluated in seconds rather than hours. This is the type of application where you can get some real utility from your micro. Good luck and happy filtering.■

```
      :P$ = "-40DB": GOSUB 6:Y = 167:P$ = "-50DB": GOSUB 6: GOTO 550
540 Y = 8:P$ = "+10DB": GOSUB 6:Y = 28:P$ = " 0 DB": GOSUB 6:Y = 48:P$ = "
      -10DB": GOSUB 6:Y = 68:P$ = "-20DB": GOSUB 6:X = 5:Y = 88:P$ = "-30DB
      ": GOSUB 6:Y = 108:P$ = "-40DB": GOSUB 6:Y = 128:P$ = "-50DB": GOSUB
      6:Y = 148:P$ = "-60DB": GOSUB 6:Y = 167:P$ = "-70DB": GOSUB 6
550   ROT= 16:FF$ =  STR$ (FF * .2 ^ W):X1 = 42: GOSUB 560:FF$ =  STR$ (FF *
      .5 ^ W):X1 = 100: GOSUB 560:FF$ =  STR$ (FF):X1 = 145: GOSUB 560:FF$ =
       STR$ (FF * 2 ^ W):X1 = 190: GOSUB 560: FOR J2 = 3 TO 5:FF$ =  STR$ (
      FF * J2 ^ W):X1 = X1 + (8 - J2) * 5: GOSUB 560: NEXT : ROT= 0: RETURN

560   IF  LEN (FF$) > 4 THEN  FOR J1 = 1 TO 4:X = X1:Y = J1 * 6 + 165:P$ =
       MID$ (FF$,J1,1): GOSUB 2: NEXT : RETURN
570   FOR J1 = 1 TO  LEN (FF$):X = X1:Y = J1 * 6 + 165:P$ =  MID$ (FF$,J1,I
      ): GOSUB 2: NEXT : RETURN
580   HOME : PRINT "=========": INVERSE : PRINT T$: NORMAL : PRINT "=======
      ==": VTAB 7: GOSUB 370: VTAB 22
590   VTAB 22: HTAB 38: GET O$:O =  VAL (O$) / 2: VTAB 22: HTAB 38: PRINT O
      $
600   IF O$ = "R" THEN 220
610   IF O$ = "E" THEN  GOSUB 440: GOTO 580
620   IF O = 1 THEN O$ = "2ND ORDER": GOTO 670
630   IF O = 2 THEN O$ = "4TH ORDER": GOTO 670
640   IF O = 3 THEN O$ = "6TH ORDER": GOTO 670
650   IF O = 4 THEN O$ = "8TH ORDER": GOTO 670
660   GOTO 590
670   TEXT : HOME :P$ = T$ + " - " + O$: REM       GRAPH ROUTINE
680   HOME : PRINT "=====================": INVERSE : PRINT P$: NORMAL : PRINT
      "=====================": VTAB 5: PRINT "CURRENT FILTER PARAMETERS ARE
      :"
690   VTAB 7: PRINT "CENTER FREQUENCY ":FF: VTAB 9
700   PRINT  TAB( 15);" 'Q'"; TAB( 30);"SECTION": PRINT  TAB( 15);"FACTOR";
       TAB( 29);"FREQUENCY": VTAB 11: PRINT "1ST SECTION",Q(1),F(1)
710   IF O > 1 THEN  PRINT "2ND SECTION",Q(2),F(2)
720   IF O > 2 THEN  PRINT "3RD SECTION",Q(3),F(3)
730   IF O > 3 THEN  PRINT "4TH SECTION",Q(4),F(4)
740   VTAB 16: PRINT "CHANGE VALUES (Y/N) ";
750   GET Y1$: VTAB 16: HTAB 21: PRINT Y1$: IF YI$ = "N" THEN 820
760   VTAB 16: HTAB 1: INPUT "CENTER FREQUENCY (HZ) ";FF
770   VTAB 19: PRINT "1ST SECTION:": VTAB 19: HTAB 16: INPUT Q2$: HTAB 32: VTAB
      19: INPUT F2$:Q(1) =  VAL (Q2$):F(1) =  VAL (F2$)
780   IF O > 1 THEN  VTAB 20: PRINT "2ND SECTION:": VTAB 20: HTAB 16: INPUT
      Q4$: HTAB 32: VTAB 20: INPUT F4$:Q(2) =  VAL (Q4$):F(2) =  VAL (F4$)
790   IF O > 2 THEN  VTAB 21: PRINT "3RD SECTION:": VTAB 21: HTAB 16: INPUT
      Q6$: HTAB 32: VTAB 21: INPUT F6$:Q(3) =  VAL (Q6$):F(3) =  VAL (F6$)
800   IF O > 3 THEN  VTAB 22: PRINT "4TH SECTION:": VTAB 22: HTAB 16: INPUT
      Q8$: HTAB 32: VTAB 22: INPUT F8$:Q(4) =  VAL (Q8$):F(4) =  VAL (F8$)
810   GOTO 670
820   VTAB 18: PRINT "FREQUENCY SCALE - WIDE/NARROW (W/N) ";
830   GET W$: HTAB 37: VTAB 18: PRINT W$
840 W = 1: IF W$ = "N" THEN W = .430676559: GOTO 860
850   IF W$ <  > "W" THEN 820
860   VTAB 20: PRINT "PAGE 1 OR PAGE 2  (1/2) ";
870   GET PG$:PG% =  VAL (PG$) + 1: HTAB 25: VTAB 20: PRINT PG$
880   IF PG% < 2 OR PG% > 3 THEN 860
890   VTAB 22: PRINT "GRAPH - NEW/OVERLAY/REVIEW  (N/O/R) ";
900   GET Y$: HTAB 37: VTAB 22: PRINT Y$
910   IF Y$ = "N" THEN 940
920   IF Y$ = "O" THEN 940
930   IF Y$ = "R" THEN  GOSUB 440: GOTO 670
940 PG% =  VAL (PG$) + 1: IF Y$ = "N" THEN 980
950   IF Y$ <  > "O" THEN 890
960 Y1 = 0: POKE  - 16302,0: POKE  - 16304,0: POKE  - 16297,0: IF PG% = 2 THEN
       POKE  - 16300,0: POKE 230,32: GOTO 1000
970   IF PG% = 3 THEN  POKE  - 16299,0: POKE 230,64: GOTO 1000
980   IF PG% = 2 THEN  HGR : POKE  - 16302,0:X = 70:Y = 3: GOSUB 2: GOSUB 5
      00:Y1 = 0
990   IF PG% = 3 THEN  HGR2 :X = 70:Y = 3: GOSUB 2: GOSUB 500:Y1 = 0
1000   IF T = 2 THEN 1050
1010   IF T = 3 THEN 1070
1020   FOR I = .204 TO 1.96 STEP .04: GOSUB 10: NEXT
1030   FOR I = 2 TO 3 STEP .1: GOSUB 10: NEXT
1040   FOR I = 3.25 TO 4.75 STEP .25: GOSUB 10: NEXT : GOTO 1100
1050 F% = 0:I = 1: GOSUB 85:F% = 1: FOR I = 4.95 TO 2 STEP  - .25: GOSUB 8
      0: NEXT
1060   FOR I = 1.96 TO .204 STEP  - .04: GOSUB 80: NEXT : GOTO 1100
1070   FOR I = 4.75 TO 3 STEP  - .25: GOSUB 45: NEXT
1080   FOR I = 2.9 TO 2 STEP  - .1: GOSUB 45: NEXT
1090   FOR I = 1.96 TO .204 STEP  - .04: GOSUB 45: NEXT
1100   POKE  - 16368,0: GET P$: GOSUB 5: GOTO 220
```

Program listing.

References

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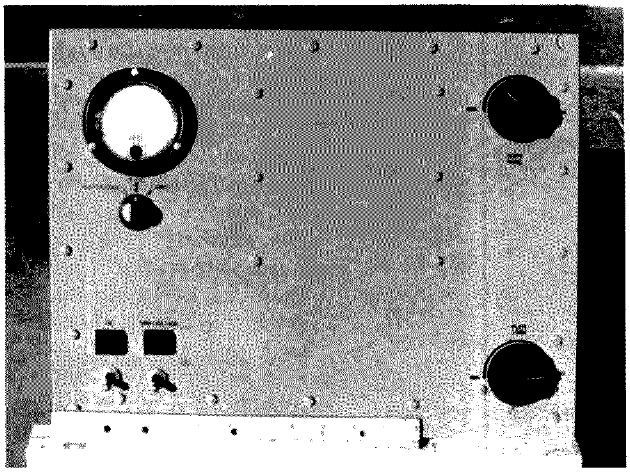


Front view of amplifier.

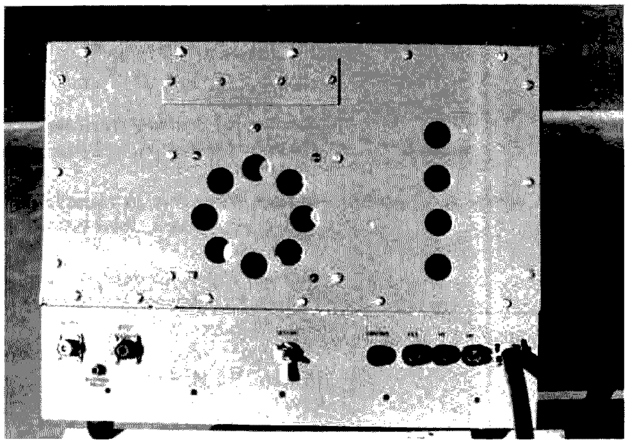
The addition of the 160-meter band to most amateur transceivers since the 60s has steadily increased interest in the "top band" to the point that it sounds like 75 phone during periods of good propagation. Often plagued by noisy atmospheric conditions and marginal antenna systems, this band is a prime candidate for an amplifier that will allow consistent communications.

With these considerations in mind, the AKF 160/1000 came about. (Its name is derived from the fact that it was built for my father, WØAKF. The "160/1000" is self-explanatory.)

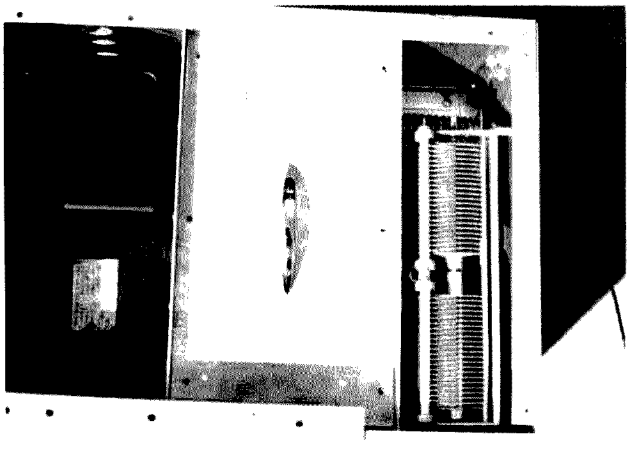
Primary design considerations for the construction of the 160/1000 were:

- single band—160 meters only
- low cost, using on-hand or readily available surplus parts
- must be "desk-top" and capable of 1 kW dc input
- tube(s) must be readily available and inexpensive

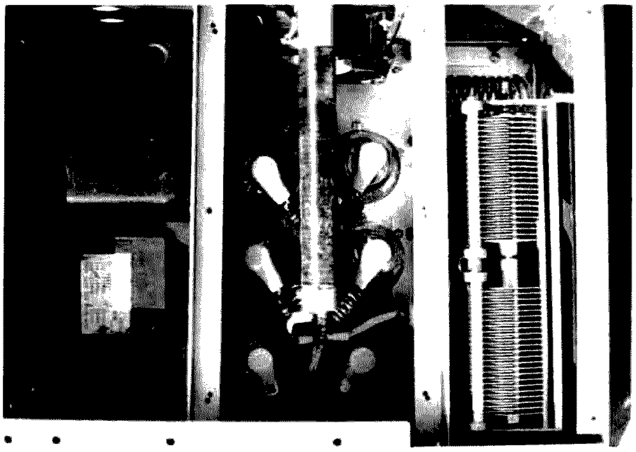
The final choice of tubes (811As) was primarily dictated by the above consider-



Rear view of amplifier showing intake and exhaust ports.



Top view of amplifier with tube chamber covered.

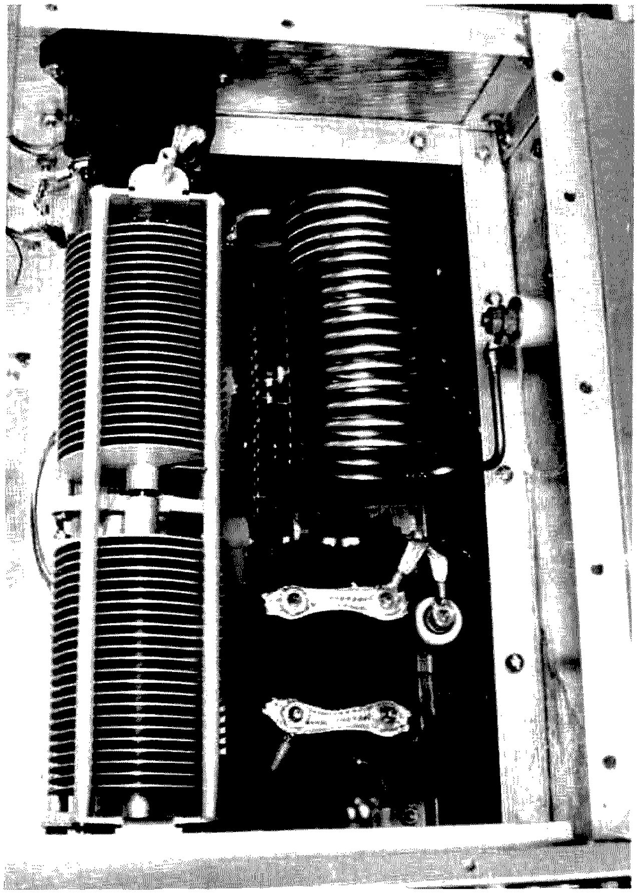


Top view of amplifier with tube chamber exposed. Note ZD1 in front of the filament transformer.

ations. Also, suitable filament and plate transformers were on hand. The venerable 811A triode has been used in many proven commercial and home-brew amplifier designs over the years and is still available—both new and used—for less than $15.00.

The circuit is a straightforward grounded-grid design using six 811As in parallel. I found that the input and plate-load impedances for a single 811A were 300 and 5k Ohms, respectively. This is equal to 50 and 833 Ohms, respectively, when six tubes are used in parallel. I found this to be desirable for several reasons:

- The 50-Ohm input Z would make it easy to drive with a solid-state transceiver, even with no tuned input circuit. (A 1:1 pi-net input was used anyway.)
- Although the 833-Ohm plate Z will result in high values of plate-tune and plate-load capacitances when looking into a standard pi-net, smaller variable capacitors are easily padded into the approximate tuning range by fixed values.
- The low plate Z also allows use of a smaller value of inductance which in turn saves space. (I tried several toroidal inductors but had difficulty with core heating—probably due to high current flow.)



Side view of amplifier showing the plate tune and pi-net coil. Note the Plexiglas sheet forming the near chamber wall, and also the surplus mica capacitors.

A single dual-movement meter with appropriate shunts was used for monitoring the three standard circuit functions. They are:

- plate current (0–1.5 Amps)
- grid current (0–1 Amps)

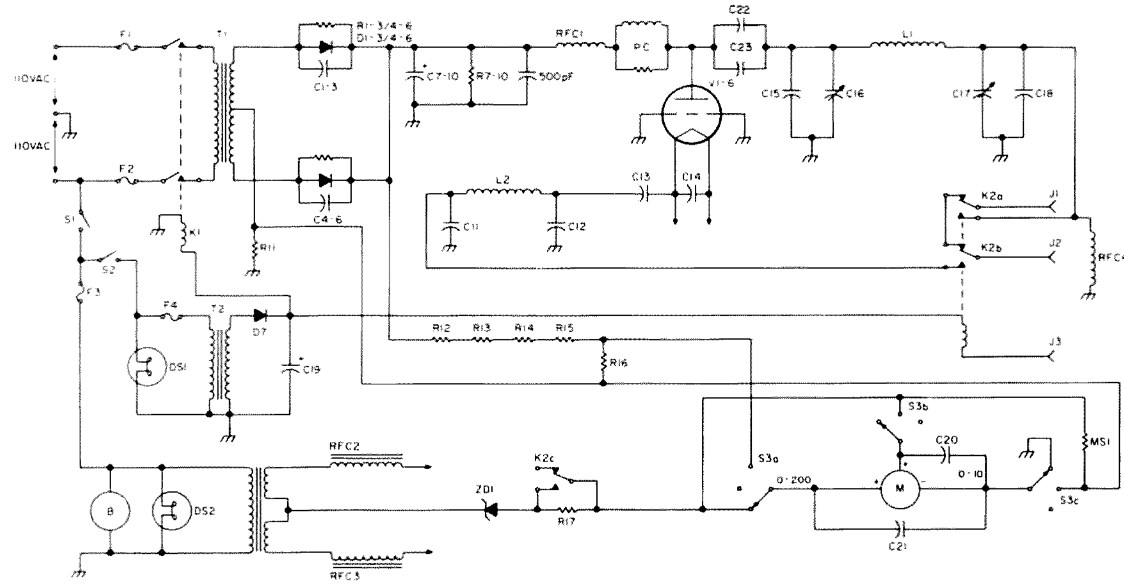
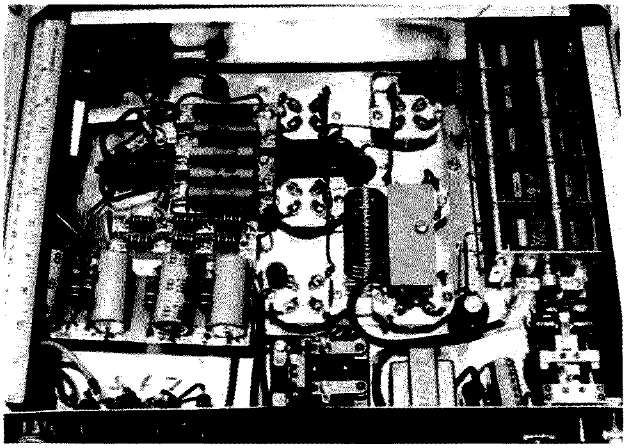


Fig. 1. Schematic.



Under-chassis view of the amplifier. Left: power-supply components and HV-meter multiplier resistors. Center: tube sockets, filament choke, and input pi-net mounted on a standoff. Center bottom: ac power relay and 24-V-dc power supply. Right: input loading capacitor, antenna relay, and safety rf choke.

- high voltage (0–2 kV dc)

The metering can be modified to allow use of just about any low-cost or surplus instrument. In fact, separate meters for each function may be desirable.

Bias is developed in the center-tap return of the filament transformer by using a 6.2-V, 50-Watt zener diode. Zero signal plate I was found to be about 100 mA. Plate I is cut off during receive by resistor R17.

The power supply is a standard full-wave design and uses a surplus plate transformer rated at 500 mA CCS (available from Fair Radio Sales). Though it looks small, the transformer is very heavy and no excessive heating will occur.

Many component changes can be made to suit parts on hand as long as voltage ratings and values are observed. The main point is to not be afraid to experiment with different parts and layouts.

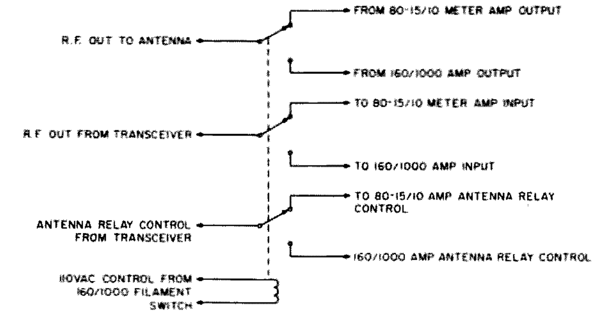


Fig. 2. Amplifier switching circuit for using two station amplifiers with a common antenna switching system. Alleviates cable swapping when going from one amp to another.

If your station already has an 80–15/10-meter amplifier, the circuit in Fig. 2 will allow automatic switching of rf and control functions between the two amps. This of course alleviates the cable-swapping behind the operating desk. It uses surplus DPDT power relays with 110-V-ac coils and is activated when the 160/1000 filaments are turned on. It was constructed in an aluminum minibox and placed near the station antenna switch.

Construction

The general layout and construction techniques I used should be evident from the photos.

Due to the low frequency, lead lengths are not as critical as they would be in the upper HF spectrum. However, your final layout should be such that leads are heavy, direct, and as short as possible.

I prefer using a commercial chassis as the amp foundation, then surrounding it with ⅛″-thick aluminum sheet held together with ¾″ aluminum angle and #8 or #10 hardware. Scrap aluminum sheet is fairly inexpensive, and when only straight cuts are required, the total cost of a heavy-duty rf-tight cabinet can be quite low.

Of special interest is the

Parts List

B	4″ muffin fan, 115 V ac	MS	meter shunt to match M above
C1-6, 13-14, 20-21	.01 μF, 1 kV disc	PC	parasitic choke: two 100-Ohm, 2-Watt carbon resistors in parallel with 4 turns #14, ½″ diameter
C7-10	100 μF, 450 V dc		
C11-12	3330 pF silver mica (three 1000s and one 330 in parallel)	R1-6	470k, 1 Watt
C15	.001 μF, 5 kV mica	R7-10	470k, 2 Watts
C16	1000 pF, 2 kV dc	R11	50 Ohms, 12 Watts
C17	2000 pF, 1 kV dc (receiver-type spacing)	R12-16	50k, 10 Watts
C18	.005 μF, 2.5 kV dc	RFC1	plate choke (370 turns #24 enamel on 1″-diameter hardwood dowel)
C19	1000 μF, 50 V dc		
C22-23	.002 pF, 5 kV mica block capacitors	RFC2	bifilar-wound filament choke (#10 enamel to fill 7½″ × ½″ ferrite rod—Amidon Assoc.)
DS1-2	115-V-ac pilot-lamp assembly		
F1-2	15 Amps		
F3	2 Amps	S1-2	SPST
F4	½ Amp	S3	3-pole/3-position rotary switch
J1-2	SO-239 coax jack	T1	115/115-V-ac primary; 2250-V-ac c-t, 500-mA secondary (surplus Collins Radio transformer from Fair Radio Sales #TF1UX02YY)
J3	RCA chassis jack		
K1	DPST or DPDT 25-Amp contacts/24-V-dc coil (surplus relay)		
K2	3PDT 10-Amp contacts/24-V-dc coil (surplus relay)	T2	115-V-ac primary; 24-V-ac c-t secondary (Radio Shack)
L1	17½ turns, #6, 2″ diameter	T3	115-V-ac primary; 6.3-V-ac c-t secondary, 24 Amps (Fair Radio Sales)
L2	17 turns, 1″ diameter, 2″ long		
M	surplus meter (0–200 and 0–10-mA movements)	ZD	zener diode, 6.2 V dc, 50 W, TO-3 case or stud mount

amplifier cooling. The six tubes are enclosed in a chamber formed of aluminum sheet and Plexiglas™ (the wall between the tubes and the pi-net is ¼" Plexiglas). Air is forced through the chamber using a standard muffin fan. A 1" gap in the front of the chamber top plate allows the air to move into the power-supply area. Four holes behind the plate transformer allow the air to exit the cabinet. This has the added effect of providing air circulation around the plate transformer.

Operation

This amplifier has room to spare when it comes to power output. Since the number of tubes and plate voltage may vary from amp to amp, no discrete tuning information is given. However, outputs in excess of 1100 Watts have been achieved when operating into a dummy load. I have found that tuning for maximum power output and then decreasing the drive level to the legal limit seems to give the best linearity. Check your metering and watch your signal on a monitor scope (the best piece of equipment a ham can have in his station). No evidence of flat-topping has been noticed, and the output appears to be a linear reproduction of the input when driven by a TS-830S at full power and viewed on the station monitor.

On-the-air comments have been excellent, with much interest expressed in the number and type of tubes. It is hoped that the 811A fanatics among you will add two more tubes and try construction of this amp. Good luck.

Special thanks go to my father, WØAKF, for his patience while I built this amp. The greatest reward is to hear him using it during our twice-weekly schedule. ■

✓ See List of Advertisers on page 98

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 6

situation by Tim. He's been making considerable progress, with several more licensed hams in immediate prospect . . . and more to come. Perhaps my talks are having some results? Old Doc Green gave the Computex opening-ceremonies address to a good-sized audience of Chinese businessmen.

My message for them is the same as for America—If Taiwan wants to be able to cope with the electronics revolution, it has to have engineers, technicians, and scientists to develop new products, to help make, sell, operate, and service them. Lacking technical people, Taiwan will have to just make do by copying the designs of others; they will always be two or three years behind.

And how does a country develop the needed technical people? Simple, really, just make sure that you expose kids 14 and 15 years old to high-tech hobbies such as amateur radio. It's no coincidence that Japan has ham-radio clubs in every high school in their country. They are, as a result, graduating seven times as many electronics engineers as the US, and with half our population! Thus, Japan has been able to take away virtually every consumer electronics industry from the entire world, including the US.

The electronics revolution has a long way to go, so there's still time for countries like Taiwan to develop the needed technical people and get in there and compete with Japan . . . designing state-of-the-art technical products and thus getting a good piece of the action. But without getting ham-radio clubs into every school on Taiwan, the country will be sentenced to copying—to stealing the ideas of others—as they have with their Chinese copies of the Apple and IBM computers and Rolex and Tiffany watches.

I've been giving this message in my talks to business groups in Taiwan for several years and I think the message is beginning to take. Now if I could only get some attention here in the US!

From Taiwan I went on to Hong Kong to see some more potential manufacturers and buy some goodies. The prices are best there for Sony, Seiko, and so on. The whole tour to four countries took just two weeks and got me back just in time for the Chicago Summer Consumer Electronics Show and then my yearly *USS Drum* submarine reunion.

Sherry was with me on the tour, going on to Manila from Hong Kong to see her suppliers. She imports some clever cloth and wire butterflies which she sells through gift shops and florists. She then met me in Mobile for the reunion, missing CES.

Now, about Taiwan and that DXpedition. My first thought was that it might be possible to work out something which would coincide with the October tour of Asian consumer electronics shows. I've been on that tour many times and will be going again this year. In two weeks, this gets you to electronics shows in Tokyo, Taiwan, Hong Kong, and Seoul . . . nine different shows in two weeks!

There are usually 200 to 300 on this tour, a good percentage of whom are hams, so it would be a natural if the DXpedition could be tied in with the tour. Unfortunately, with magazine deadlines taking so much time, there just wasn't enough time to get the word out, make all the ar-

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1. Entries must be received by November 1, 1984.
2. To enter, write an article describing your best home-brew construction project and submit it to *73*. If you haven't written for *73* before, please send an SASE for a copy of our author's guide.
3. Here's the catch: The total cost of your project must be $73 or less, even if all parts were bought new. Be sure to include a detailed parts list with prices and sources.
4. Our technical staff will evaluate each project on the basis of originality, usefulness, reproduciblity, economy of design, and clarity of presentation. The decision of the judges is final.
5. All projects must be original, that is, not previously published elsewhere. There is no limit to the number of projects you may enter.
6. All rights to articles purchased for publication become the property of *73*.
7. Mail your entries to:

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80 Pine Street
Peterborough NH 03458
Attn: Home-Brew III

Dr. Green shaking a Model 100 computer at the Central New England College graduating class, threatening them with the coming need for a massive increase in communications in order to cope with the computer revolution.

Tim Chen BV2A wants you to come and DXpedition from Taiwan. How about it?

Some of the 1984 Computer Show Tour Group visiting a Korean computer factory.

Tokyo Disneyland is an immaculate must. A kid spilled some popcorn and within seconds three people appeared from nowhere and cleaned it up.

rangements, and have things in order bv October first.

I talked with Tim about the possibility of my bringing a repeater over and setting it up so that the American operator team could have good personal communications. Possible, but this will take some education of those in charge and some dickering. I talked with Bob Chang, who runs Commerce Tours, and he said he could arrange with the Ambassador Hotel for a safe place to set up the repeater.

We're going to have quite a ham contingent on the '84 October show tour, so I'd been thinking in terms of arranging for us to get HTs in Japan which we could use in Hong Kong and Korea. . . and perhaps even Taiwan. The turmoil of my merger with CW Communications and starting several new magazines and businesses scotched the HT plan for this year. Maybe in '85.

If about ten of you would be interested in getting over to see Tim and operating for about five or six days from Taipei next spring, drop me a line. I would estimate that the whole trip would cost about $3,000 which would include transportation, hotels, a week in Taiwan, plus a few days in Tokyo and Hong Kong. By then we may be able to work out the two-meter repeater and HT situation.

If I can get ten positive and a few more possible candidates for the DXpedition, I'll start Commerce on setting up the arrangements and start working with Tim to cover the legal formalities.

Have you ever wondered what it's like to operate from the heart of Asia? To get on from a rare spot and have the whole world beating your brains out for a contact? It's heady stuff. I've operated from some pretty rare spots and it's really addictive. Why leave all the real DXing to Lloyd and Iris?

Computer nuts will go right out of their minds when they see the prices for Apple- and IBM-compatible boards in Taipei. And almost every American computer book is available for a couple bucks, reprinted there.

The food is superb and the sights incredible, from their museums to Snake Alley. Your camera will be snapping day and night. So, are you game for a little DXpedition to the Republic Of China next May, running from about May 15th to 30th?

Who knows, between the Computex computer show in Taiwan and the products made in the People's Republic of China—which you can visit on the same trip, going up for a one-day visit from Hong Kong—you might find a product to import and distribute. That would make this a business trip, right?

Your wife? Why not? There's no shortage of things for her to see while you are busy filling your log with contacts. And a businessman really needs some sort of assistant on a trip like this. . . to get details and prices from manufacturers while you are DXing.

If you can get away for more than two weeks, for a few bucks extra you can return via some interesting places and maybe get in a few more days DXing. A little over a year ago I made the trip back from Hong Kong, stopping off to work DX from Bangkok, Singapore, Kuching (Sarawak), Bandar Seri Begawam (Brunei), Kota Kinabaiu (Sabah), and Manila. If you're interested in operating from any of these places, I can put you in touch with a local ham who will help you and perhaps even let you use his station for a couple of days. Brunei is a new country now. . . how about it?

Akihabara, made into a pedestrian mall on Sundays, is an electronics Mecca. There are hundreds of electronics, radio, and computer stores all in one part of Tokyo. Several American hams visiting here have tried to defect.

Some Chinese dinners are memorable! You won't forget your Taiwan visit.

BARTER 'N' BUY

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SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

POMONA CA
AUG 4

The Tri-County Amateur Radio Association will hold its annual hamfest on Saturday, August 4, 1984, from 8:00 am to 4:00 pm, at Palomares Park Recreation Hall, 491 E. Arrow Highway (the north side of Arrow Highway at Orange Grove, between Towne and Garey), Pomona CA. Admission is a $1.00 donation. Swap tables (2½' × 8') are a $5.00 donation per table and the hall will open at 7:00 am for setup only. Tables are limited and must be reserved in advance (no personal tables will be allowed inside or outside the hall). Food, drink, and free parking will be available. Features will include awards, programs, and VCR tapes; and examinations will be given, if possible, for Novice, Technician, General, and Advance class licenses. Talk-in on 146.025+. For advance registration, make checks payable to TCARA and send with an SASE to Joe Lyddon WB6UFX, 6879 Sard Street, Alta Loma CA 91701.

TRAIL BC CAN
AUG 4

The Beaver Valley Amateur Radio Club will hold a swapfest on August 4, 1984, beginning at 10:00 am, at the Cominco Arena, Trail BC. Talk-in on 146.84/.24. For further information and reservations for table space, please contact BVARC, c/o 3798 Woodland Drive, Trail BC V1R 2V7.

JACKSONVILLE FL
AUG 4-5

Six amateur radio clubs of the greater Jacksonville area will sponsor the eleventh annual Greater Jacksonville Hamfest on August 4-5, 1984, at the Orange Park Kennel Club, US 17 South near I-295. Registration is $4.00; swap tables are $9.00 for one day or $15.00 for the weekend. (All proceeds go to the promotion of amateur radio.) Saturday hours are 8:00 am to 5:00 pm and Sunday hours are 9:00 am to 3:00 pm. Features will include a large swap-table area, forums and programs, exhibitors, and plenty of free parking. Special discounts and promotions are available to exhibitors contracting for space before July 15th. For registrations, swap tables, special hotel rates, and more information, write Mike Parnin N4EPD, 6716 Diane Road, Jacksonville FL 32211.

LEVELLAND TX
AUG 5

The Northwest Texas Emergency Net and the Hockley County Amateur Radio Club will sponsor the 19th annual Northwest Texas Emergency Net Swapfest and Picnic on Sunday, August 5, 1984, beginning at 8:00 am, in the City Park, Levelland TX. A $3.00 registration fee is requested but not required. This is a family event, so bring your own picnic basket. Tables will be provided for the all-day swapping. Talk-in on .28/.88. For more information, contact John R. Bell W5NGX, 208 Pat Street, Levelland TX 79336.

PITTSBURGH PA
AUG 5

The 47th annual South Hills Brasspounders and Modulators Hamfest will be held on August 5, 1984, from 9:00 am to 4:00 pm, at the south campus of the Community College of Allegheny County, Pittsburgh PA. Tickets are $3.00 each or 2 for $5.00. There will be indoor and outdoor flea-market space, food, refreshments, and free parking will be available. Talk-in on 146.13/.73 and 146.52 simplex. For further information, contact Jack B. Wood, 448 Jenne Drive, Pittsburgh PA 15236.

ANGOLA IN
AUG 5

The Steuben County Radio Amateurs will present the 26th annual FM Picnic and Hamfest on Sunday, August 5, 1984, at Crooked Lake, Angola IN. Admission is $2.50. Features will include picnic-style BBQ chicken, inside tables for exhibitors and vendors, a large electronics flea market, and overnight camping (fee charged by County Park). Talk-in on 146.52 and 147.81/.21.

AUSTIN TX
AUG 10-12

The Austin Amateur Radio Club and the Austin Repeater Organization will sponsor Austin Summerfest '84 on August 10-12, 1984, at the Austin Marriott Hotel, Interstate 35 at Highway 290. Admission is $5.00 in advance (deadline: July 31st) and $7.00 at the door. Swapfest tables are available on a first-come, first-served basis, but each seller may reserve tables in advance (limit 2) for $1.00 each and claim them by 10:00 am Saturday. Activities will include a 20-kHz 2-meter band-plan forum, a packet-radio discussion and demonstration, a transmitter hunt, and a full schedule of ladies' programs. Admission to the ladies' events is $4.00. Talk-in on 146.34/.94. For more information, write Austin Summerfest '84, PO Box 13473, Austin TX 78711.

TACOMA WA
AUG 11-12

The Radio Club of Tacoma (W7DK) will present Hamfair 1984 on August 11-12, 1984, at Olsen Auditorium on the campus of Pacific Lutheran University. Registration is $5.00 and trailer and dormitory space will be available on campus at reasonable rates. Advance registration is available for the Saturday-night banquet, commercial space, and flea-market tables. Talk-in on 147.88/.28 (W7DK). For additional information and advance registration, please contact Grace Teitzel AD7S, 701 South 120th, Tacoma WA 98444.

CHARLOTTE VT
AUG 11-12

The annual BARC International Hamfest will be held on Saturday and Sunday, August 11-12, 1984, at the Old Lantern Campgrounds, Charlotte VT. Tickets are $4.00 for both days and heterodynes under 12 will be admitted free. Flea-market space is $2.00 and indoor space is $5.00. Overnight camping will be available and features will include the Can-Am tug-of-war. Talk-in on .34/.94, .01/.61, and .52 simplex. For additional information, contact Roger Farley WA1OZE, President, Burlington ARC, PO Box 312, Burlington VT 05402.

CANYON TX
AUG 11-12

The Panhandle Amateur Radio Club, Inc., will hold its annual hamfest on Saturday and Sunday, August 11-12, 1984, in the Student Activities Center, West Texas State University, Canyon TX. Doors will open at 8:00 am each day with plenty of free tables and space for all. Registration per person is $5.00 in advance and $6.00 at the door. Features will include a swapfest, commercial distributors, meetings, and a ladies program. Talk-in on 146.94 and 3.933 MHz. For more information on pre-registration, motels, and RV camps, contact the PARC, PO Box 10221, Amarillo TX 79116, or Jim Ogle WB5UDX at (806)-359-1002.

WARRINGTON PA
AUG 12

The Mid-Atlantic Amateur Radio Club will hold its annual hamfest on Sunday, August 12, 1984, from 9:00 am to 4:00 pm, rain or shine, at the Bucks County Drive-In, Route 611, Warrington PA (5 miles north of the Willow Grove exit of the Pennsylvania Turnpike). Admission is $3.00 with $2.00 additional for each tailgate space (bring your own table). Ample parking and refreshments will be available. Talk-in on 147.66/.06 (WB3JOE/R) or 146.52. For further information, write MARC, PO Box 352, Villanova PA 19085, or call Bob Josuweit WA3PZO at (215)-449-9727.

WILLOW SPRINGS IL
AUG 12

The 50th annual Hamfesters' Hamfest will be held on Sunday, August 12, 1984, at Santa Fe Park, 91st and Wolf Road, Willow Springs IL (southwest of Chicago). Tickets are $3.00 in advance and $4.00 at the gate. There will be an exhibitors' pavilion and the famous swappers' row. Talk-in on 146.52. For advance tickets, send a check or money order to Hamfesters, PO Box 42792, Chicago IL 60642.

GEORGETOWN KY
AUG 12

The Bluegrass Amateur Radio Society will sponsor the Central Kentucky ARRL Hamfest on Sunday, August 12, 1984, from 8:00 am to 5:00 pm, at Scott County High School, Lonlick Road and US Route 25, Georgetown KY (off I-75/64). Tickets are $3.50 in advance and $4.00 at the gate. There is no charge for outside flea-market space. Features will include technical forums, awards, and exhibits in a/c facilities. For more information or tickets, write Edward B. Bono WA4ONE, PO Box 4411, Lexington KY 40504.

ST CLOUD MN
AUG 12

The St. Cloud Amateur Radio Club will hold its annual hamfest on Sunday, August 12, 1984, from 8:00 am to 4:00 pm, at the Sauk Rapids Municipal Park, Sauk Rapids MN. Talk-in on 146.34/.94. For further information, contact the St. Cloud Amateur Radio Club, PO Box 141, St. Cloud MN 56302.

✓ See List of Advertisers on page 98

HAVRE MT
AUG 17-19

The Northcentral Montana Hamfest will be held on August 17-19, 1984, in Beaver Creek Park at Marden's Campground, 28 miles south of Havre MT.

OAKLAND NJ
AUG 18

The Ramapo Mountain ARC (WA2SNA) will hold its 8th annual flea market on August 18, 1984, at the Oakland American Legion Hall, 65 Oak Street, Oakland NJ (just 20 miles from the GW Bridge). Admission is $1.00 and non-ham family members will be admitted free. Indoor tables are $6.50 and tailgating is $3.00. Talk-in on 147.49/146.49 and .52. For more information, contact Tom Risseeuw N2AAZ, 63 Page Drive, Oakland NJ 07436, or call (201)-337-8389 after 6:00 pm.

HUNTSVILLE AL
AUG 18-19

The Huntsville Hamfest will be held on Saturday and Sunday, August 18-19, 1984, at the Von Braun Civic Center, Huntsville AL. There is no admission charge. Flea-market tables are $4.00 per day and should be reserved in advance. There will be exhibits, forums, an air-conditioned indoor flea market, and non-ham activities. Tours of the Alabama Space and Rocket Center are available for the family. A limited number of camping sites with hookups are available at the VBCC on a first-come, first-served basis. Talk-in on .34/.94. For more information, write Huntsville Hamfest, 2804 S. Memorial Parkway, Huntsville AL 35801.

LAFAYETTE IN
AUG 19

The Tippecanoe Amateur Radio Association will hold its 13th annual hamfest on Sunday, August 19, 1984, beginning at 7:00 am, at the Tippecanoe County Fairgrounds, Teal Road and 18th Street, Lafayette IN. Tickets are $3.00. Features will include a large flea market, dealers, and refreshments. Talk-in on .13/.73 and .52. For advance tickets and more information, write Lafayette Hamfest, Route 1, Box 63, West Point IN 47992.

TRUMANSBURG NY
AUG 25

The Finger Lakes Hamfest will be held on August 25, 1984, at the Trumansburg Fairgrounds, 12 miles NW of Ithaca NY. There will be exhibits, a flea market, refreshments, and overnight camping. For more information, contact Wanda Lovejoy KO2X, 443 Jerry Smith Road, Lansing NY 14882.

BLOSSBURG PA
AUG 25

The Tioga County Amateur Radio Club will hold its 8th annual hamfest on Saturday, August 25, 1984, from 9:00 am to 5:00 pm, at Island Park, Blossburg PA, just off Route 15. Admission is $3.00 and XYLs and children will be admitted free. Features will include a flea market, dealers, traders, demonstrations of computers and 2-way ATV, a QSL contest, an on-premise transmitter hunt, programs for XYLs and harmonics, and radio-controlled airplanes. A snack bar will be available. Talk-in on 146.19/.79, 146.52/.52, and CB. For more information, contact Carl E. Kimble WB3EUE, PO Box 37, Cowanesque PA 16918, or phone (614)-367-5345.

HERSHEY PA
AUG 26

The Central Pennsylvania Repeater Association, Inc., will hold its 11th annual Hamfest/Computerfest on August 26, 1984, adjacent to Hersheypark, Hershey PA. Registration is $3.00 and wives and children will be admitted free. There will be a special reduced admission to Hersheypark for families of registrants. At the large indoor dealer and flea-market area, 10-foot spaces are $8.00 each, 8-foot tables are $4.00 each, and single electric plugs are $1.00 each. A large outdoor tailgating area and food and refreshments will be available also. Talk-in on 145.47, 146.76, and 146.52 MHz. For further information, contact Timothy R. Fanus WB3DNA, 6140 Chambers Hill Road, Harrisburg PA 17111, or phone (717)-564-0897 between 12:00 noon and 8:00 pm, or contact Barrie L. Schwartz W3ENL, Hamfest Secretary, 3545 September Drive, Camp Hill PA 17011, or phone (717)-763-8728.

MARYSVILLE OH
AUG 26

The Union County Amateur Radio Club will hold its 8th annual hamfest on Sunday, August 26, 1984, beginning at 6:00 am, at the fairgrounds in Marysville OH. Tickets are $2.50 in advance and $3.00 at the gate; XYLs and children will be admitted free. A 10-foot flea-market space is $1.00 (no electricity available). There will be food. For further information and tickets, contact Gene Kirby W8BJN, 13613 US 36, Marysville OH 43040, or phone (513)-644-0468.

CHEROKEE OK
AUG 26

The 2nd annual Great Salt Plains Hamfest will be held on August 26, 1984, from 9:00 am to 5:00 pm, at the Community Building on the south side of the Great Salt Plains Lake in north-central Oklahoma. Features will include technical forums, organizational meetings, free swap tables, refreshments, Novice exams, and a noon pot-luck dinner. Overnight camping and RV hookups are available at the Lakes State Park. Talk-in on the 147.90/.30 Salt Plains repeater. For more information, write Steven Walz WA5UTO, Box 222, Cherokee OK 73728, or phone (405)-596-3487.

MARSHALL MI
AUG 26

The fifth annual Trunk 'n' Trailer Bash will be held on Saturday, August 26, 1984, from 7:00 am to 3:00 pm, at the Calhoun County Fairgrounds, Michigan Avenue (I-94 and I-69), Marshall MI. Donations are $1.50 in advance (until August 15th) and $2.00 at the gate; ten-pack tickets in advance are $10.00. Trunk sales spaces are $3.00 each, 10-foot booths are $5.00 each (limited tables available for $5.00 each), and on-site overnight camping is $5.00. Snacks and free parking will be available. Talk-in on the 145.35 repeater (down 600) and 146.52 simplex. For more information, send an SASE to Earl Goodrich K8UCQ, 117 East Michigan Avenue, Marshall MI 49068, or phone (616)-781-5555.

SEWELL NJ
AUG 26

The Gloucester County ARC will sponsor the GCARC 25th Anniversary Ham/Comp Fest on August 26, 1964, from 8:00 am to 4:00 pm, at the Gloucester County College, Sewell NJ. Admission is $2.00 in advance and $2.50 at the door; tailgating is $3.00 per space. Food, facilities, and a shuttle bus from the parking area to the hamfest will be available. Features will include seminars, contests, computer demonstrations, a flea market, and commercial displays. This will be the official VEC testing center for testing Novice through Extra. There will be 810 forms available for morning and afternoon testing and no pre-registration is necessary. Talk-in on 146.52, 147.78/.18, and 223.36/224.96. For further information and reservations, contact Milt Goldman K3WIL, 801 Crown Point Road, Westville NJ 08093, (609)-456-0500, or John M. Fisher K2JF, PO Box 370, Pitman NJ 08071, (609)-589-2318.

HAMPTON IA
AUG 26

The Iowa 75-Meter Net will sponsor a hamfest and picnic on August 26, 1984, in the WKW Park, one mile north of Hampton, off Highway 65. There will be a potluck dinner at noon. Talk-in on 147.15/.65 (Mason City repeater). For more information, contact Philip D. Brown WD0FWB, 1459 3rd Street SE, Mason City IA 50401, or Lovelle Pedersen WB0JFF, 2327 W. Reinbeck Road, Hudson IA 50643.

LEBANON TN
AUG 28

The Short Mountain Repeater Club will sponsor the Lebanon Hamfest on Sunday, August 26, 1984, at Cedars of Lebanon State Park, US Highway 231, Lebanon TN. There will be outdoor facilities only and exhibitors must bring their own tables. Food and drink will be available. Talk-in on 146.31/146.91. For further information, contact Morris Duke W4WXO, 210 Disspayne Drive, Donelson TN 37214.

DANVILLE IL
AUG 26

The Vermilion County Amateur Radio Association will hold its annual hamfest and flea market on Sunday, August 26, 1984, from 6:00 am to 3:00 pm, at the clubhouse in Harrison Park West, Danville IL. Tickets are $1.00 in advance and $1.50 at the gate. Talk-in on 146.22/.82 and .52 (KB9GS repeater). For more information, contact John Cunningham WA9WJG, Box RY, Perrysville IN 47974, (317)-793-4444, or Joe Mayer KB9GS, 613 E. Kelly Avenue, Box 356, Westville IL 61883, (217)-267-2946.

ST. CHARLES MO
AUG 28

The St. Charles Amateur Radio Club will hold Hamfest '84 on August 26, 1984, at the St. Charles City Hall Complex. General admission is $1.00. The Harvester Lions will provide the barbeque. Riverfront Park and the historic south Main Street area are just a few blocks away. Talk-in on 146.07/.67 and .52 simplex. For more information, contact Ron Ochu KO0Z, 1914 West 5th Street, St. Charles MO 83301.

LARAMIE WY
SEP 7-9

The Northern Colorado ARC, the University of Wyoming ARC, and the Shy-Wy ARC will jointly sponsor the fifth annual High Plains Ham Roundup on September 7-9, 1984, at the Yellow Pine Campground in the Medicine Bow National Forest (35 miles west of Cheyenne). There are no registration fees except for a modest Forest Service charge for campers. Saturday's schedule will include a campfire cookout and bring-your-own covered-dish extravaganza (barbecued hamburgers and liquid refreshments provided), with sing-along music and entertainment by regional talent. Also on Saturday will be a giant tailgate swapfest, a transmitter hunt, and technical displays. Talk-in on .22/.82 and .25/.85. For further information, write Jack Hayes W7CGK, 1321 E. 22 Street, Cheyenne WY 82001.

UNIONTOWN PA
SEP 8

The Uniontown Amateur Radio Club will hold its 35th annual Gabfest on the Saturday after Labor Day, September 8, 1984, on the club grounds located on the Old Pittsburg Road, just off Route 51 and the 119 bypass, Uniontown PA. Registration is $3.00 each or 2 for $5.00. There will be free parking, free coffee, and a free swap and shop with registration. Refreshments will be available. Talk-in on 147.645/.045 and 144.57/.17. For further information, contact UARC Gabfest Committee, c/o John T. Cermak WB3DOD, PO Box 433, Republic PA 15475, or phone (412)-248-2870.

WINDSOR ME
SEP 8

The Augusta Emergency Amateur Radio Unit will sponsor the 1984 ARRL-sanctioned Windsor Hamfest on Saturday, September 8, 1984, at the Windsor Fairgrounds, Windsor ME. The gate donation is still $1.00 and camping will be available on Friday and Saturday nights. Features will include a flea market, programs, speakers, commercial distributors, light meals, and the traditional Saturday bean and casserole supper. Talk-in on the 146.22/.82 repeater. For further information, contact Don Hanson N1AZH, RFD #2, Box 3678, Greene ME 04236, or phone (207)-946-7557.

SAN ANGELO TX
SEP 8-9

The San Angelo Amateur Radio Club will hold CEN TEX HAMFEST '84 on September 8-9, 1984, in the San Angelo Convention Center. Tickets are $5.00 in advance and $6.00 at the door. Hours for Saturday are noon to 6:00 pm and for Sunday, 8:00 am to 2:00 pm. Special events for the ladies include a Saturday afternoon tour of Fort Concho and Old San Angelo. There will be seminars and group meetings Saturday afternoon and Sunday morning, and a reception for dealers followed by a social hour for amateurs on Saturday night. Talk-in on 146.34/.94. For pre-registration or hotel/motel accommodations, write CEN TEX HAMFEST '84, PO Box 3751, San Angelo TX 76902.

MELBOURNE FL
SEP 8-9

The Platinum Coast Amateur Radio Society will hold its 19th annual hamfest and indoor swap-and-shop flea market on September 8-9, 1984, at the Melbourne Auditorium. Admission is $3.00 in advance and $4.00 at the door. Swap tables are $10.00. There will be food and plenty of free parking available, as well as awards, forums, and meetings. Talk-in on .25/.85 and .52/.52. For reservations, tables, and more information, write PCARS, PO Box 1004, Melbourne FL 32901.

TORRINGTON CT
SEP 9

The CO Radio Club will hold its hamfest on Sunday, September 9, 1984, from 8:00 am to 4:00 pm, at the Torrington Retirees Drop-In Center, East Albert Street. Admission is $2.00, tables are $7.00, and the fee for tailgating is $5.00. Talk-in on 146.05 and 147.24. For more information, write Donald D. Taylor KA1GKJ, PO Box 455, Watertown CT 06795.

MONETT MO
SEP 9

The Ozarks Amateur Radio Society will hold the 3rd annual Ozarks Amateur Radio Club Congress and Swapfest on Sunday, September 9, 1984, beginning at 11:00 am, at the Monett City Park, junction of highways US 60 and MO 37, Monett MO (between Springfield and Joplin). There is no

admission charge and no charge for swap space (available on a first-come, first-serve basis). The buffet dinner begins at 1:00 pm (bring a single covered dish and share in the feast). Talk-in on the 146.37/.97 repeater and 7.250 MHz. For more information, contact the Ozarks Amateur Radio Society, Box 327, Aurora MO 65605.

CARTERVILLE IL
SEP 9

The Shawnee Amateur Radio Association will hold its 28th annual hamfest on September 9, 1984, at the John A. Logan Junior College Campus, Route 13 west, Carterville IL (6 miles east of Carbondale). Admission is $3.00 and flea-market tables are free. Activities will include forums, ladies events, and lunch served on the campus. There will be camping available across the road, motels nearby, and plenty of free parking. Talk-in on 3.925 from 8:00 am to 9:00 am and on 146.25/.85. For more information, phone Bill Johnson W9ERI at (618)-457-7586.

GRAND RAPIDS MI
SEP 15

The Grand Rapids Amateur Radio Association, Inc., will hold its annual Swap and Shop on Saturday, September 15, 1984, beginning at 8:00 am, at the Hudsonville Fairgrounds. There will be dealers, a concession, an indoor sales area, and an outdoor trunk-swap area. Talk-in on 146.16/.76. For more information, write Grand Rapids Amateur Radio Association, Inc., PO Box 1248, Grand Rapids MI 49501.

PEORIA IL
SEP 15-16

The Peoria Area Amateur Radio Club will hold its Peoria Superfest '84 on September 15-16, 1984, at the Exposition Gardens, W. Northmoor Road, Peoria IL. The gate opens at 6:00 am and the Commercial Building at 9:00 am. Admission is $3.00 in advance and $4.00 at the gate; children under 12 will be admitted free. Activities will include amateur-radio and computer displays, a huge flea market, a free bus to Northwoods Mall on Sunday, and a Saturday-night informal get-together at Heritage House Smorgasbord, 8209 N. Mt. Hawley Road, Peoria IL. There are full camping facilities on the grounds. Talk-in on 146.16/.76 (W9UVI). For reservations and more information, send an SASE to Superfest '84, PO Box 3461, Peoria IL 61614.

MT. CLEMENS MI
SEP 16

The L'Anse Creuse Amateur Radio Club will hold their 12th annual swap and shop on Sunday, September 16, 1984, from 9:00 am to 3:00 pm, at the L'Anse Creuse High School, Mt. Clemens MI. Take I-94 eastbound to the Metropolitan Parkway exit; then take the Metropolitan Parkway to Crocker; turn left on Crocker to Reimold and then right on Reimold to the last school, L'Anse Creuse High School. Admission is $1.00 in advance and $2.00 at the door. FCC representatives will be there, as well as plenty of new and used gear. There will be lots of food and parking. Talk-in on 147.69/.09 and 146.52. For more information, send an SASE to Maurice Schietecatte N8CEU, 15835 Touraine Court, Mt. Clemens MI 48044, or phone (313)-286-1843.

NEW KENSINGTON PA
SEP 16

The Skyview Radio Society will hold its annual hamfest on Sunday, September 16, 1984, from noon until 4:00 pm, at the club grounds on Turkey Ridge Road, New Kensington PA. Registration fee is $2.00 and vendors' fees are $4.00. Awards will be presented. Talk-in on .04/.64 and .52 simplex.

AUGUSTA GA
SEP 16

The Amateur Radio Club of Augusta will hold its annual hamfest on September 16, 1984, at Julian Smith Casino Park. Tickets are $1.00 each, 6 for $5.00, or 13 for $10.00. Features will include a flea market in the parking lot, a barbecue, refreshments, dealers, entertainment, and on Saturday evening, a hospitality room at Ramada Inn West, Washington Road, rooms 108-110. Talk-in on 145.49 – 600. For more information, send an SASE to D. F. Miller WB4YHT, Hamfest Chairman, 4505 Shawnee Road, Martinez GA 30907, or call 1-(404)-860-3700.

GRAYSLAKE IL
SEP 22-23

The Chicago FM Club will sponsor Radio Expo '84 on Saturday and Sunday, September 22-23, 1984, at the Lake County Fairgrounds, Rtes. 120 and 45, Grayslake IL. Tickets, good for both days, are $3.00 in advance and $4.00 at the gate. The flea market will open at 6:00 am and the exhibits will open at 9:00 am. There will be a giant outdoor flea-market area. Reserved indoor flea-market tables are available for $5.00 per day. Other features will include seminars, technical talks, ladies' programs, and free parking and overnight camping. Talk-in on 146.16/.76. For more information, send an SASE to Radio Expo '84, Box 1532, Evanston IL 60204, or phone (312)-582-6923.

VIRGINIA BEACH VA
SEP 22-23

The 1984 ARRL Roanoke Division Convention and 9th annual Amateur Radio/Computer Fair will be held on Saturday and Sunday, September 22-23, 1984, from 9:00 am to 5:00 pm both days, at the Virginia Beach VA Pavilion. Admission for both days is $4.00 in advance and $5.00 at the door. Flea-market tables are $5.00 for one day and $8.00 for both days. Features include dealers, special displays, forums, computer equipment, a giant flea market, free XYL bingo, and movies for the kids. For tickets and more information, write Jim Harrison N4NV, 1234 Little Bay Avenue, Norfolk VA 23503, or call (804)-587-1695.

WICHITA FALLS TX
SEP 22-23

The annual Wichita Amateur Radio Society Tornado Alley Hamfest will be held on Saturday and Sunday, September 22-23, 1984, at the National Guard Armory, Wichita Falls TX. The hours on Saturday will be 9:00 am to 5:00 pm and on Sunday, 9:00 am to 2:00 pm. Registration will begin at 9:00 am both days and is $4.00 per person in advance and $5.00 at the door. Pre-registration closes Wednesday, September 19th. There will be a large indoor flea market and tables are $3.00 each. Features will include commercial dealers' displays, computer dealers and demonstrations, ladies' activities, and special events. If you wish to take an amateur exam, send FCC form 610 to the hamfest address prior to August 17, 1984. A concession stand will be open both days. Talk-in on 146.34/.94, 147.75/.15, 449.30/444.30, and 449.20/444.20. For more information or pre-registration, contact WARS Hamfest, PO Box 4363, Wichita Falls TX 76308.

GAINESVILLE GA
SEP 23

The 11th annual Lanierland ARC Hamfest will be held on September 23, 1984, beginning at 9:00 am, in the Holiday Hall at Holiday Inn, Gainesville GA. There will be free tables and an inside display area for dealers reserving in advance. A large parking lot will be available for the free flea market. Other features will include a left-foot CW contest, a ladies' country store, and many activities. Talk-in on 146.07/.67. For more information and reservations, contact Phil Loveless KC4UC, 3594 Thompson Bend, Gainesville GA 30506, or call (404)-532-9160.

WICHITA KS
SEP 23

The Wichita Hamfest will be held on September 23, 1984, at Camp Hiawatha, 1701 West 51st Street North, Wichita KS 67204. Features will include a flea market, programs, and commercial exhibits. For more information, contact Norm Tramba WA8HWH, 340 S. 1st, Clearwater KS 67026, or phone (316)-584-6425.

WILLIMANTIC CT
SEP 23

The Natchaug Amateur Radio Association will hold its annual giant flea market on Sunday, September 23, 1984, from 9:00 am to 4:00 pm, at the Elks Home, 198 Pleasant Street (off Route 32), Willimantic CT. Admission is $2.00 and children under 16 will be admitted free. Tables are $5.00 in advance and $7.00 at the door (dealers will be admitted at 8:00 am). Food, drinks, and free parking will be available. Talk-in on the 147.30/147.90 repeater and .52 direct. For more information, contact Ed Sadeski KA1HR, 49 Circle Drive, Willimantic CT 06226, or phone (203)-456-7029.

ADRIAN MI
SEP 23

The Adrian Amateur Radio Club will hold its 12th annual hamfest on Sunday, September 23, 1984, at the Lenawee County Fairgrounds, Adrian MI. Because tables are limited, reservations (by check or cash) must be made no later than September 15, 1984. For more information, tickets, or tables, contact Adrian Amateur Radio Club, PO Box 26, Adrian MI 49221.

HAMILTON ONT CAN
OCT 6

The Hamilton Amateur Radio Club, Inc., will hold its 2nd annual flea market on Saturday, October 6, 1984, beginning at 8:30 am, at Marritt Hall, Ancaster Fairgrounds, 625 Highway 53 East. Admission is $2.00. Flea-market vendors' 8-foot tables are $4.00 plus admission and commercial vendors' 8-foot tables are $10.00 with admission included. There will be room for 150 vendors and setup will be from 7:00 am to 8:30 am. Coffee, soft drinks, and sandwiches will be available. Talk-in on 146.16/146.76 (VE3NCF). For space reservations, contact HARC Flea-Market Committee, PO Box 253, Hamilton ONT L8N 3C8. For more information, contact Stan VE3GFE on VE3NCF.

SANTA FE NM
OCT 7

The Northern New Mexico Hamfest will be held on October 7, 1984, from 8:00 am to 3:00 pm, at the Terrero Group Shelter, along the Pecos River, east of Santa Fe. Admission is $3.00 for adults and $1.50 for children. Activities will include a tailgate flea market, group meetings, family games, fishing, and picnicking. There will be hot dogs, chips, soft drinks, and coffee available, as well as free Saturday-night camping. Talk-in on local repeaters and .52 simplex. For further information please send an SASE to Northern New Mexico ARC, c/o Bob Norton N5EPA, Route 3, Box 95-15, Santa Fe NM 87501, or call on 3.939 MHz at 0100 UTC.

YONKERS NY
OCT 7

The Yonkers Amateur Radio Club will sponsor the Yonkers Electronics Fair and Giant Flea Market on Sunday, October 7, 1984, from 9:00 am to 4:00 pm, rain or shine, at the Yonkers Municipal Parking Garage, corner of Nepperhan Avenue and New Main Street, Yonkers NY. Admission is $2.00 each and children under 12 will be admitted free. Gates will be open to sellers at 8:00 am and there will be a $6.00 admission per parking space which will also admit one (bring your own tables). Refreshments, free parking, and sanitary facilities will be available, as well as unlimited free coffee. There will be live demonstrations all day and a giant auction at 2:00 pm. Talk-in on 146.265T/146.865R or .52 direct. For more information, write YARC, 53 Hayward Street, Yonkers NY 10704, or phone (914)-969-1053.

PARAMUS NJ
OCT 14

The Bergen ARA will hold a Ham Swap 'n' Sell on October 14, 1984, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. There will be tailgating only; bring your own table. Admission for sellers is $4.00; buyers will be admitted free. Thousands of spaces will be available. Talk-in on .79/.19 and .52. For more information, write Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855, evenings only.

HAM HELP

Tornado and/or thunderstorm-detection article from very early *73* magazine needed. Will be happy to pay any reasonable copy costs. Will also pay copy costs for any other electronics articles on the same subject.

Jim Weir WB6BHI
13281 Grass Valley Ave.
Grass Valley CA 95945

I am looking for the service manual for the NCX-3, or schematics for the power supply for the NCX-3 (by National).

Dennis Bosley WA1URS
186 Hickam Drive
Loring AFB ME 04751
(207)-328-4432

Wanted: Atwater Kent speaker.

O. R. Galbraith K5TVC
4303 Kingsway Drive
Farmington NM 87401

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

THE POSTMAN GETS RELIEF

This year's FUN! Poll, the fourth annual installment, saw our postman get some much needed rest. The acquisition of PO Box 73 and the use of electronic mail meant that my friendly mail carrier didn't have to suffer this year with a heavy mail sack and icy sidewalks.

Response levels were down this time. In 1983, 1,190 hams wrote in to express their views. This year, 987 of you mailed or electronically transmitted your responses. Still, that's a significant amount of mail to open, read, and tabulate. It took four people to accomplish the manual work and five computers (a TRS-80 Model III, an Apple IIe, an Atari 400, and a TRS-80 Model 100) to manipulate the numbers. Mainframe computers in Columbus, Ohio, and McLean, Virginia, transmitted the electronic responses to FUN! HQ.

Here's what you had to say.

ELEMENT 1 BACKGROUND

1) Sex:
A) Male—97%
B) Female—3%
No surprise here.

2) Age:
A) 15 or below—3%
B) 16-21—5%
C) 22-39—27%
D) 40-59—38%
E) 60 or above—27%
The graying of amateur radio. These numbers are heading upward with each poll.

3) License class:
A) Novice—8%
B) Technician—12%
C) General—31%
D) Advanced—39%
E) Extra—10%
Somehow, I expected more Extras to respond.

4) Number of years licensed:
A) 1 year or less—2%
B) 1-5 years—31%
C) 6-10 years—13%
D) 11-20 years—32%
E) 21 years and up—22%
Just about the same statistics as last year.

5) Do you have a new (post-March '78) call?
A) Yes—52%
B) No—48%
The "yesses" break the 50% mark for the first time.

6) How many hours a week do you devote to amateur radio?
A) 0-1 hour—8%
B) 2-5 hours—35%
C) 6-10 hours—33%
D) 11-20 hours—19%
E) 21 hours or more—5%
Activity seems down a bit from last year.

7) Which HF band do you use most?
A) 80-75 meters—17%
B) 40 meters—25%
C) 20 meters—21%
D) 15 and/or 10 meters—24%
E) Don't operate HF—13%
About the same numbers as last year. Next time, we'll include the WARC bands.

8) Which VHF-UHF band do you use most?
A) 6 meters—2%
B) 2 meters—74%
C) 220 MHz—6%
D) 420 MHz and/or up—4%
E) Don't operate VHF-UHF—14%
Also about the same.

9) Which mode do you use most?
A) SSB—42%
B) CW—18%
C) FM—31%
D) RTTY—5%
E) Other—4%
Same again.

10) How much money have you spent on amateur radio within the past year? (Include QSL expenses, magazine subscriptions, club dues, and other incidental expenses.)
A) 0-$250—51%
B) $251-$500—30%
C) $501-$1,000—13%
D) $1,001-$2,500—4%
E) $2,501 and up—2%
The economy is up, but ham sales are still down.

ELEMENT 2 SOCIAL CHARACTERISTICS

11) Has amateur radio influenced your career choice?
A) Greatly—24%
B) Somewhat—22%
C) Not at all—54%
Less of an influence than last year.

12) Should the ARRL get rid of the DXCC Honor Roll?
A) Yes—61%
B) No—39%
Sending a message to Newington.

13) Politically, how would you define yourself?
A) Conservative—51%
B) Middle-of-the-road—48%
C) Liberal—3%
We're getting more conservative.

14) Should the ARRL get rid of the DX Century Club?
A) Yes—51%
B) No—49%
We're split.

15) How old were you when you first became a ham?
A) 15 or below—13%
B) 16-21—50%
C) 22-39—21%
D) 40-59—11%
E) 80 or above—5%
No significant change from last year.

16) Should the FCC increase the speeds on amateur CW examinations?
A) Yes—13%
B) No—87%
Shaky fists.

17) Do you own a home computer?
A) Yes—55%
B) No—45%
We've broken the 50-percent barrier! Who would have thought it, only a few years ago?

18) Do you think hams, compared to computer hobbyists, are:
A) More technically inclined in their hobby—26%
B) Less technically inclined in their hobby—38%
C) About equally skilled in their hobby—36%
Not much change here.

19) Do you think that home computing is siphoning people (including youngsters) away from amateur radio?
A) Yes—60%
B) No—40%
If you don't believe this, you're kidding yourself.

20) Will the volunteer exam system increase cheating?
A) Yes—45%
B) No—55%
Not exactly a vote of confidence.

21) Should volunteer examiners be allowed to collect a fee to help defray expenses?
A) Yes—71%
B) No—29%
And the FCC agrees.

22) Has ham radio helped to make you a better person?
A) Yes—75%
B) No—25%
That's nice.

23) Should ham licenses have a minimum age requirement?
A) Yes—45%
B) No—55%
Oh, pooh to you 45 percenters. You want to kill the hobby, or what?

24) Should hams be subject to periodic retesting?
A) Yes—6%
B) No—94%
Ah, we all remain confident in our skills.

ELEMENT 3 OPERATING HABITS

25) If the users were restricted to data communication only (no phone or CW operation), would you be in favor of a no-code 220-MHz, digital-class license?
A) Yes—43%
B) No—57%
I guess 220 is too busy as it is.

26) Would you be in favor of a no-code 220-MHz, digital-class ticket if it permitted phone operation in addition to data transmission?
A) Yes—6%
B) No—94%
I hear you, I hear you!

27) Have you ever used a personal computer in connection with your amateur-radio activities?
A) Yes—70%
B) No—30%
Up 11 percent from last year. A very good sign.

28) Is it time to completely deregulate amateur radio by having the FCC turn over all responsibility for ham operation to the amateur community?
A) Yes—55%
B) No—45%
Exactly the same numbers as last year. I guess we still don't totally trust ourselves.

29) What do you think of people who view pay-television services with MDS converters and satellite dishes that are not approved by broadcasters?
A) They're skunks—37%
B) They're within their rights—63%
Okay.

30) Should we get rid of, or reduce in size, the CW subbands?
A) Yes—61%
B) No—39%
No big change here.

31) Do you think DX nets have a place in ham radio?
A) Yes—34%
B) No—66%
Let's dump 'em.

32) Do you think nets in general have a place in ham radio.
A) Yes—70%
B) No—30%
A liberal attitude.

33) The next time a ham operates from space, which band should he/she use?
A) 2 meters—12%
B) 220 MHz—4%
C) 450 MHz—36%
D) An even higher band—12%
E) Shouldn't bother to operate—36%
Says a lot about the state of 2 meters and amateur radio in general.

34) If, while tuning across a band, you heard a net called "Jammers International" in progress, would you:
A) Jam it—8%
B) Ignore it—13%
C) Complain to the FCC or some other organization—63%
D) Listen—15%
E) Join it—1%
A sensible attitude, I think.

35) If required, could you solidly copy CW at the speed at which you were licensed?
A) Yes—70%
B) No—30%
Yeah, sure.

36) If required, could you pass the FCC theory test for your license class?
A) Yes—72%
B) No—28%
Uh, huh.

37) Have you ever purposely operated in an amateur subband you weren't licensed to use?
A) Yes—10%
B) No—90%
Whew.

38) Do you think the ARRL affects amateur radio in a positive manner?
A) Yes—37%
B) No—63%
Those figures need some work.

39) Do you ever speak to foreign, non-English-speaking hams in their own language?
A) Always—2%
B) Sometimes—16%
C) I attempt it—25%
D) Rarely—5%
E) Never—52%
No major change from last time.

40) Do you feel yourself competent to replace the finals in a tube-type rig?
A) Yes—90%
B) No—10%
You pull on the glass part.

41) Do you feel yourself competent to replace the finals in a transistor-type rig?
A) Yes—74%
B) No—26%
A handy talent, to be sure.

42) Do you solder together your own coax connectors?
A) Yes—95%
B) No—5%
Good.

43) Is your antenna system mounted on your house or a tower?
A) House—93%
B) Tower—7%
I don't have room for a tower, either.

44) Have you ever designed your own antenna?
A) Yes—4%
B) No—96%
The gremlins crept into this question. I don't know who was responsible for leaving it off the response form, but whoever you are, I sentence thee to two-dozen lashes with a section of RG-58/U (better

make that RG-8/U). By the way, I've never designed a skyhook, either.

45) What do you think of contesting?
A) Great—10%
B) Good—25%
C) Okay—11%
D) Don't like it—23%
E) Despise it—31%
No significant change here.

46) What do you think of DXing?
A) Great—35%
B) Good—27%
C) Okay—12%
D) Don't like it—12%
E) Despise it—14%
Or here.

47) What do you think of repeaters?
A) Great—35%
B) Good—10%
C) Okay—35%
D) Don't like them—12%
E) Despise them—8%
Or here.

48) What do you think of traffic handling?
A) Great—10%
B) Good—29%
C) Okay—29%
D) Don't like it—11%
E) Despise it—21%
Or here, either (ho-hum).

49) If you heard an emergency net in progress, would you immediately join in and offer your services?
A) Yes—64%
B) No—36%
I say, stay away until you're called for.

50) Should all hams be required to join some type of national amateur-radio organization?
A) Yes—11%
B) No—89%
The independent spirit lives.

SELECTED COMMENTS

I hope they don't get a minimum age requirement or I'll probably be off the air for a few years (age 14).—**KC0XK**

This is the first time I have participated in a survey like this. Tnx.—**K9QWJ**

Hey! Why no provocative questions this year? Re question 23, there should be a maximum age—**AF2M**

Most CW operators on a DXpedition operate at a high rate of speed—35 to 40 wpm. I think this adds to the confusion. People "think" they worked him instead of knowing they did. It also makes it hard for the 20-wpm-and-under people to work the station.—**N4TL**

I'm sorry to see very few questions about the ARRL... More attention should be given [by the League] to young people; less money wasted by the big shots in Newington and less control of power by the old, biased Board of Directors.—**N4CXF**

At age 74 I am now an SWL of ham bands. Do have gear for two complete stations, but the personal thrill is gone.—**W6KBH**

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

You know, sometimes the weather can be vicious! I mean, here I am in May, writing a column for August, and the Baltimore weather is as hot and muggy as any summer day. Oh well, my sinuses do not appreciate that!

I bring this up to tell the tale of how I escaped the heat by retreating to my basement, an unfinished subterranean recess which is naturally cool and contains boxes and boxes of material yet unpacked from our move last year. In one of them I found a whole bunch of letters from some of you, many of which remain unanswered. I shall share some of them, along with some recent arrivals, with you all today.

An article in a recent issue of *Scatter*, the journal of the Southern Counties (CA) Amateur Teleprinter Society, raises an interesting point. With all of the discussion about video and computer RTTY setups, we tend to overlook the many amateurs who continue to use mechanical teleprinters. Years ago, we used to terminate each line with two carriage returns, one line feed, and two letters characters, i.e., CR-CR-LF-LTRS-LTRS. While this may be overkill and may double-space for the station that inserts a line feed for each carriage return, a truncated CR-LF-LTRS-LTRS would still be very appropriate and allow those with mechanical-type baskets the luxury of copying the beginning of each line.

Let's go a step further and look at the variety of ways in which RTTY stations can communicate, from direct to through a repeater. We recognize that transmission delays through a repeater may chop a second or two off the front of a transmission and that mechanical clutches may need a character or two to come up to speed. Further, garbage may have crept in and left the carriage in the middle of the current line. What is needed is a protocol to ensure that the beginning of each transmission is received and that each line is received as well.

One such procedure would be to activate the transmitter, then either pause with a blank carrier for a few seconds or send a timing signal composed of either BLANKS (Murray code 00000) or LETTERS (Murray code 11111). Follow this with one carriage return, one line feed, two LETTERS, and then send each line of the transmission. Follow each line with the same CR-LF-LTRS-LTRS sequence. When you are through, send another end-of-line sequence to place the printer on a blank line so that garbage will not cause the printer to overtype your just-sent data, and turn off the transmitter.

Now, moving right along, regards to Tom Clancy N8RC. Tom is living up in Frederick, Maryland, quite a ways from here, and is looking to return to RTTY after years away. Come on in, Tom, the techniques may have changed, but it's more fun than ever! Let me know how you do.

Theodore E. Deusner of Kennewick, Washington, asks about receivers for RTTY reception. One of the ones he asks about is the venerable Hammarlund HO-180. This receiver, or any other one which is stable enough to receive SSB, should be fine for RTTY. If the receiver has a bandpass which prevents generation of the "common" RTTY audio tones, in the 2000-Hz range, it is possible to use alternate tones that would still work but would fall within the "standard" SSB bandpass. Good luck with the efforts.

Another note here is from Bill Pascale W6JED of Oroville, California. Bill has been a fan of the column since his interest peaked on RTTY, and he states that he enjoys the column. So do I, Bill, and I especially enjoy hearing from you all; thanks for the letter.

A letter from Dick Chambers WA4GKR in Wilmington, North Carolina, asks a question that is on many an amateur's mind. He wants to know which features of modern RTTY terminals are desirable, and which of a series of named units is the "best" in several of these areas. Some of the features Dick mentions are the ability to send and receive CW, ASCII, and various speeds of Murray, as well as split screen, buffers, automatic screen formatting with word wrap and editing, and the like. Well, Dick, my first response is to state that RTTY is a mode that is, to me, as captivating running an old Teletype® Model 15 as it is with a video terminal. So, I am not really sure which of these, or other, features will be important to *you*! I would advise you to just try to get onto RTTY with as little outlay as possible, enjoy the mode for a while, and then upgrade your station with those features that you have heard about and seem important to you.

The problem with rating the various terminals, Dick, is that I have little more information than you do. Like you, I read the ads and the press releases published in the various journals. I have also written to most of the manufacturers for specific information and, almost without exception, have received little in the way of concrete information. If I have been given access to a piece of equipment, you can be sure I have written all I could find out about it while running it through its paces. But those events have been few and far between. Most manufacturers have not even supplied information over that in the ads; some have promised material and never come through. If I could build some sort of comparison, I would, but I hesitate to build it on only the claims gleaned from advertisements. Hope this helps.

Now, Edward Stetzer K2ZBA writes a note asking about one of the units I did review, the Microlog 6800. Edward, I had that unit up and operating through the courtesy of Microlog for about a week and was thoroughly impressed. I reviewed the terminal in the February and March, 1981, RTTY Loop columns in *73*. I am sending Edward some of that information; others who are interested are invited to look at those issues of the column. I have not had the opportunity to see any of the more recent stuff coming out of Microlog, but with the solid base of the original 6800, I feel sure they are moving onward and upward.

Years ago, I had an old tube-type, rack-mounted, and very heavy demodulator made by the Northern Radio Corporation. This came to mind with the receipt of a letter from Joe Sabo KB7NU of Bothell, Washington. Joe writes that he is the service manager at Northern Radio, in Redmond, Washington, manufacturers of marine SSB equipment. The Northern Radio company that manufactured the RTTY equipment, much of it for the military, was a different company. Nonetheless, Joe's company receives about five to ten calls a month asking for parts or service for that old, but venerable, equipment. Joe points out that the RTTY manufacturer Northern Radio was sold to RF Harris, who later sold the parts inventory to QEI. They may still have a limited supply of parts for old Northern RTTY equipment. You might address any questions to QEI, Inc., 60 Faden Road, Springfield, New Jersey 07804. Thanks for the information, Joe.

Jim Pruitt WA7DUY from Lewiston, Idaho, is another ham interested in putting his CoCo onto RTTY. Once again, Jim, the best source for CoCo software that I have seen is Clay Abrams, 1758 Comstock Lane, San Jose, California 95124. Clay features a variety of CoCo-compatible RTTY software and should have a disk version available soon. Right, Clay?

The third issue of basic RTTY tips is now available and may be obtained by sending $2.00 to me at the address at the top of this column. Of course, the first two issues remain available, and I shall be including a listing of what is available for those who missed previous issues. For those who came in late, much of this information was covered here in RTTY Loop during the first few years of the column and is being offered as a service to those newcomers who may have missed it.

Some hardware is on the books for next month—that and more, you never can tell, here in RTTY Loop.

HAM HELP

An American priest who has been a missionary in India for many decades wishes to set up a ham-radio station in a boys' orphanage. It would be used for educational purposes and so that he can contact his many benefactors in the United States, Canada, and England. Donations of working ham-radio equipment or donations of funds to purchase such equipment are being requested on his behalf. Please address:

Rev. Father A. Seeber S.D.B.
The Citadel
18 Landon's Rd
Madras 600 010
India

Wanted at a reasonable price: two i-f transformers for an R-392 receiver and the following tubes: twelve 6AJ5s, four 26A6s, two 26C6s, two 26D6s, and two 26A7s.

Johnny E. Carr WA4FCC
Route 2
Rockmart GA 30153

I am hoping to get in touch with someone regarding programming an EPROM for a paging encoder manufactured by Zetron in Bellevue, Washington.

Charles L. Kelsey WB2EDV
RD #2, Box 63, Elmwood Avenue
Mayville NY 14757

SATELLITES

Amateur Satellite Reference Orbits

RS-5		RS-6		RS-7		RS-8		
UTC	EQX	UTC	EQX	UTC	EQX	UTC	EQX	Date
0055	208	0003	201	0126	217	0115	208	1
0050	208	0146	228	0116	216	0112	209	2
0045	209	0131	226	0106	215	0109	210	3
0039	209	0115	224	0057	214	0107	210	4
0034	209	0100	221	0047	213	0104	211	5
0029	209	0045	219	0037	212	0101	212	6
0023	209	0029	217	0028	211	0058	213	7
0018	210	0014	215	0018	210	0055	214	8
0012	210	0157	242	0008	210	0052	214	9
0007	210	0142	240	0158	239	0050	215	10
0002	210	0126	237	0148	238	0047	216	11
0156	240	0111	235	0139	237	0044	217	12
0151	241	0056	233	0129	236	0041	218	13
0145	241	0040	230	0119	235	0038	219	14
0140	241	0025	228	0110	234	0035	219	15
0135	241	0009	226	0100	233	0033	220	16
0129	241	0153	253	0050	232	0030	221	17
0124	241	0137	251	0041	231	0027	222	18
0119	242	0122	248	0031	231	0024	223	19
0113	242	0106	246	0021	230	0021	223	20
0108	242	0051	244	0012	229	0018	224	21
0103	242	0036	241	0002	228	0016	225	22
0057	242	0020	239	0152	257	0013	226	23
0052	243	0005	237	0142	256	0010	227	24
0047	243	0148	264	0132	255	0007	228	25
0041	243	0133	262	0123	254	0004	228	26
0036	243	0117	260	0113	253	0001	229	27
0031	243	0102	257	0103	253	0158	260	28
0025	244	0046	255	0054	252	0155	261	29
0020	244	0031	253	0044	251	0153	262	30
0015	244	0016	250	0034	250	0150	262	31
0009	244	0000	248	0025	249	0147	263	1
0004	244	0143	275	0015	248	0144	264	2
0158	275	0128	273	0005	247	0141	265	3
0153	275	0113	271	0155	276	0138	266	4
0147	275	0057	268	0145	275	0136	267	5
0142	275	0042	266	0136	274	0133	267	6
0137	275	0026	264	0126	274	0130	268	7
0131	275	0011	262	0116	273	0127	269	8
0126	276	0154	289	0107	272	0124	270	9
0121	276	0139	287	0057	271	0121	271	10
0115	276	0124	284	0047	270	0119	271	11
0110	276	0108	282	0038	269	0116	272	12
0105	276	0053	280	0028	268	0113	273	13
0059	277	0037	277	0018	267	0110	274	14

HAM IN SPACE, TAKE 2

Tony England W0ORE may become the second astronaut to carry amateur radio into space. A joint AMSAT/ARRL proposal to NASA asks that Tony be allowed to operate on his upcoming 51F/Spacelab-2 mission, scheduled to fly during March of 1985. The proposal calls for more equipment to be carried aloft than was present on Owen Garriott W5LFL's ground-breaking flight, including automatic systems that will provide unattended operation.

UOSAT-2 RESPONDS

After more than ten weeks of silence, the sweet sound of telemetry greeted workers at the University of Surrey command station. After numerous attempts, the 2-meter telemetry beacon (145.825 MHz) sprang to life on May 7, providing valuable insight into the spacecraft's condition.

Thanks to *Amateur Satellite Report* for this month's news.

HAM HELP

I am looking for a manual and/or a schematic for a Drake TR-3.

C. H. Camidge
8-C Roslin St. South
Waterloo, Ont. N2L 2G5
Canada

I am looking for a schematic for a Hallicrafters "Sky Buddy" receiver. *Any* help would be greatly appreciated.

Tom Kennedy K8TK
PO Box 67
Clark Lake MI 49234

I need a schematic for a model CA-1510 signal generator. It was made by Munston Manufacturing, Islip NY, for civil aeronautics use. I will gladly pay copy costs.

John Mock WA4LKW
2860 Gospiel Peace Rd.
Hopkinsville Ky 42240

I am looking for a schematic for a power supply to operate an old war-surplus BG-348-0 receiver. I also need schematics for 1- or 2-transistor QRP rigs and some FT-243 crystals for 40-meter CW.

Billy Suit K4BUF
Route 1 Box 194-1C
Randleman NC 27317

I need a schematic and manual for an Eico-Kit model 430 oscilloscope. I will gladly pay for any copying and mailing costs.

Larry S. Brooks WB8ECV
3185 Bunting Ave.
Grand Junction CO 81504

I am looking for information on windmill manufacturers.

Edward W. Dirksen
10685 Curtis St.
Loma Linda CA 92354

Can anyone help with coils and technical manual/schematic for a Central Electronics exciter CE-10? I will consider your old unit from the junk box as spares for a price, too.

Ragnar Otterstad
Vejdammen 5
DK 2840 Holte
Denmark

Looking for *Modern Radar: Theory, Operation, and Maintenance*, distributed in past by TAB Books. Please state condition and asking price in letter.

Edmund L. Melanson AA1H
Rte #2, Box 510
Thorndike ME 04986

Looking for a Lafayette Radio six-channel crystal-controlled receiver which covers 30-50 MHz FM, in segments of 4 MHz. Would like manual for same, also.

Charles L. Kelsey WB2EDV
RD #2, Box 63, Elmwood Ave.
Mayville NY 14757

I am in need of a Swan transceiver, model 2X. I also need manuals and schematics for the Swan 2X.

John Jackson N3CDG
71 Regent St.
Wilkes Barre PA 18702
(717)-823-3590

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

THE END OF THE IRC?

Is the International Reply Coupon on the way out? Dr. Vicente Tuason, the Director of Posts at Berne, Switzerland, recommends just that in his article in *Union Postale*. (*Union Postale* is the official publication of the Universal Postal Union, which administers the IRC.) Dr. Tuason cites the complexities of accounting for the International Reply Coupons (IRCs), and the increasing "abuses" in the form of currency speculation in IRCs.

The problem that Dr. Tuason wants to eliminate is exactly the feature of IRCs which makes them so useful in amateur radio and especially DX: IRCs are the best available approximation of a universally-accepted international currency. Since all IRCs are equivalent and can (supposedly) be redeemed in any country in the world, one can transfer funds from one country to another in the form of International Reply Coupons.

It seems that a few entrepreneurs are doing exactly that. In a country with rapid inflation, speculators are buying huge quantities of IRCs at a relatively low cost. They fly these IRCs to Switzerland, with its very stable currency, and, if their timing is right, can sell them to the Swiss Post Office for more than they originally paid! Switzerland, with its liberal banking laws and rock-steady currency, is taking the brunt of the speculating, and hence Dr. Tuason's recommendation that the International Reply Coupons be abolished.

Don't stay awake at night wondering how you're going to get that XU1SS card back without IRCs, however. Dr. Tuason's article recommending the abolition of the IRC appeared in April, 1957. The IRC has survived this and other challenges in the past 30 years, and most likely, will continue to do so for another 30.

Good thing, too, as the IRC plays a major role in DX and would be very difficult to replace. On the other hand, the IRC is one of the least understood aspects of the fine art of QSLing.

Universal Postal Union

To understand the IRC and its role, we must turn to one of the most basic tenets of international mails. When you buy a stamp for an overseas letter, *all* of the money for postage goes to the country sending, or originating, the letter. In this case, the United States Postal Service keeps the dough. The postal service in the destination country which still has to deliver the letter gets nothing. The various postal services argue that every letter will elicit a reply, so the recipient will purchase the stamp for the return letter, that country will get the funds, and the USPS delivers the letter to you for nothing.

This system requires no bookkeeping, leaves each country's postal service to set prices as it sees fit and eliminates delays while countries argue over who pays for what.

Such was the most fundamental concept of the Universal Postal Union (UPU), which was founded in 1874. (Incidentally, the UPU was founded some years after the International Telecommunications Union, and, in fact, was closely patterned after that organization.)

This system of letting each country keep its own international postal receipts worked fine except for one flaw, which was evident from the start. Some writers want to *prepay* the return postage to increase the chances of a reply. If the sender country keeps all the money for both directions, the postal service in the destination country gets nothing. But if you tried to send half of round-trip money to that country, you would have a bookkeeping nightmare.

So about 30 years after the UPU started, a solution to this dilemma was proposed: the International Reply Coupon. Approved by the 64 member countries in the UPU Congress of 1906, the IRC is now pushing 80 years old. And the concept of and need for the IRC remain unchanged.

The way the International Reply Coupon works (officially) is very simple. At any post office (well, almost any post office) you can purchase an International Reply Coupon for $0.65. You can send that IRC to someone in any member country of the Universal Postal Union, which includes just about every country in the world. The recipient can (supposedly) cash the IRC in at his post office for "one or more postal stamps representing the minimum postage for an unregistered letter sent by surface to a foreign country."

In other words, the IRC is good for stamps to mail one letter by surface transportation back to you. If you receive an IRC, you can cash it in at (almost) any post office for the postage stamps to send a surface letter overseas: say $0.30 for a letter to Europe, for example.

Postal authorities in the various countries may, at their option, exchange more than one IRC for airmail postage overseas. This gives rise to the lists in the *Radio Amateur Callbook* and other places for the number of IRCs needed to get an airmail letter back to you. This can range from as little as two IRCs to as many as six!

Note that the post office doesn't have to pay cash for the IRCs, only postage stamps. And the post office can require that you present the letter at the same time as the IRCs so that you can't even take the stamps and sell them for cash.

At least, that's the way the system is supposed to work. In practice, of course, this seldom happens. Instead, International Reply Coupons are a means of transferring small amounts of money from one country to another. IRCs are seldom cashed in because of the unfavorable exchange rate. (Who wants to lose half the money every time one exchanges an IRC for stamps?) The DXer hangs on to any IRCs he receives and uses them the next time he needs IRCs to get a card back, rather than running down to the post office and laying out $0.65 each for new IRCs.

After all, the IRCs are good "indefinitely," so why cash them in? Apparently other users than amateur radio DXers feel that way, as only about half of the IRCs issued each year are redeemed. And that includes the considerable number involved in currency speculation, a problem that continues 30 years after Dr. Tuason's article.

This "extra-postal" use of the International Reply Coupon will not be eliminated. In fact, one of the original justifications for the IRC, back in 1906, was just this service. Since small sums of money are frequently exchanged within a country in the form of postal stamps, the IRC could similarly supplement the international money-order system for very small amounts of money.

Since the IRC is supposed to be a limited form of international currency, it is not surprising that it plays that role in amateur radio. Indeed, most international amateur-radio debts can be settled in IRCs: return postage, award costs, etc. To keep the IRCs circulating, there is a "gray market" for the coupons. Most larger DX clubs and many active QSL managers and DXers collect hundreds and thousands of IRCs as they pour in from QSL-seekers. These IRCs are frequently sold for less than face value but more than their value at the post office. Typical for IRCs in bulk today would be around $0.40 to .45 each (watch the DX Bulletins for even better values, as big DXpeditions unload thousands of IRCs).

The resale market in IRCs benefits both buyer and seller. The purchaser saves considerable funds on the exchange, as opposed to buying new IRCs at the post office. The seller gets more money than the post office will give him, and this money is in the form of cash without restrictions. This exchange can be so advantageous that an active DX station, receiving lots of IRCs, can finance his entire QSL operation off the "profits." For example, VP2ML hasn't had to chip in a dime for QSL printing or postage in five years.

This particular "extra-postal" use of the IRC is so well accepted in amateur radio that even valueless IRCs are accepted and exchanged among amateurs. I still receive considerable numbers of "old" (and now worthless, at least at the post office) forms of IRCs.

"Planned Obsolescence"

"What?" I hear you say. "IRCs are good 'indefinitely'!" Indeed, UPU regulations state that the IRCs have no expiration date. In the fine print in the regulations, however, one finds the kicker: Only those IRCs whose texts agree with the official text have exchange value. Those with other wording cannot be exchanged at the post office. And the UPU changes the wording on the IRCs every few years! So despite the "indefinite" lifetime of the IRC, they do lose their official value occasionally.

The present IRC is version 15 and has been in circulation (with minor changes) since 1974 (see Fig. 1). The previous version (see Fig. 2) circulated between 1964 and 1974 and has not been accepted by the post office since 1979. Going still further back, we find an earlier version which circulated, with frequent minor changes, between 1929 and 1964 (see Fig. 3). This style was selected in a design competition in 1929 to replace the original IRC from 1906 (see Fig. 4).

I've never received one of the 1906 version, but I have a handful of the 1929-design IRCs, all received long after their "expiration" date. Since the IRC is seldom cashed in the post office, the official expiration of the IRC is not that important to the radio amateur. Since he is not going to cash it in but rather sell it to another amateur, or use it for an amateur-radio purchase, the official value of the IRC loses significance. As long as it is accepted by the amateur community, the IRC retains value.

Universal?

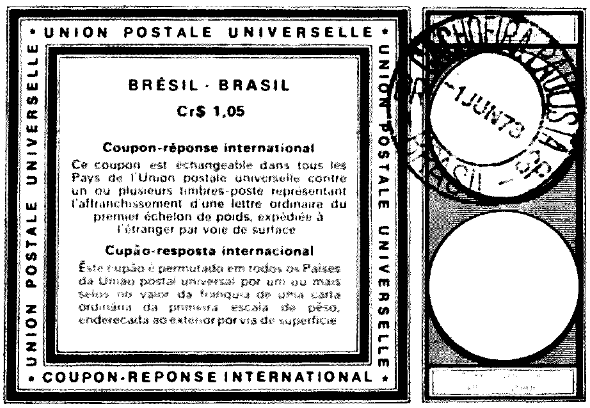
Another anomaly in the amateur-radio

UNION POSTALE UNIVERSELLE
COUPON-REPONSE INTERNATIONAL
C 22

Ce coupon est échangeable dans tous les pays de l'Union postale universelle contre un ou plusieurs timbres-poste représentant l'affranchissement minimal d'une lettre ordinaire, expédiée à l'étranger par voie de surface.

Empreinte de contrôle du pays d'origine (date facultative)	Prix de vente (indication facultative)	Timbre du bureau qui effectue l'échange
STATE COLLEGE, PA. MAR 12 1983	65 cents	

Fig. 1. The current version of the International Reply Coupon, with the price preprinted in the center. Only IRCs with a stamp of the issuing country on the left are valid at the post office.



• UNION POSTALE UNIVERSELLE •

BRÉSIL · BRASIL

Cr$ 1,05

Coupon-réponse international

Ce coupon est échangeable dans tous les Pays de l'Union postale universelle contre un ou plusieurs timbres-poste représentant l'affranchissement d'une lettre ordinaire du premier échelon de poids, expédiée à l'étranger par voie de surface

Cupão-resposta internacional

Êste cupão é permutado em todos os Países da União postal universal por um ou mais selos no valor da franquia de uma carta ordinária da primeira escala de pêso, enderecada ao exterior por via de superfície

• COUPON-REPONSE INTERNATIONAL •

Fig. 2. This type of IRC circulated until 1974 and has been obsolete since 1979. However, many still circulate through the amateur-radio community.

Fig. 3. Pre-1964 IRCs looked like this sample. A few of these still travel from amateur to amateur although they have had no official value for 20 years.

Fig. 4. A copy of the first version of the IRC, from 1906. The form and concept of the IRC have changed little in 80 years.

use of the IRC is in the Soviet-bloc countries. DXers frequently hear that IRCs are "not accepted" in Soviet countries, even though these countries are members of the Union. According to the Universal Postal Union, a country may decline to *sell* IRCs but is required to *exchange* them. However, the UPU has little enforcement power, and the Union has survived as long as it has by staying out of politics. So, many Soviet countries refuse to accept IRCs (at least at most local postal offices). Nevertheless, amateurs in these countries can and do use IRCs as international currency.

The "universality" of the IRC is not the only aspect of these coupons that local postal officials ignore. Many of the smaller post offices in this country do not stock IRCs, and the postmaster may never have heard of them. Even at larger post offices where they know what an IRC is, one can buy invalid IRCs.

Officially, the IRC must be of the current form, with the continuous UPU watermark. (Hold your IRC up to the light to see the watermark.) The current version of the IRC has the official text in seven languages: French, German, English, Arabic, Chinese, Spanish, and Russian. Each IRC must be stamped with the country of sale on the *left* side, as shown in Fig. 1. Unstamped IRCs or those stamped on the right are no good, and the post office can refuse to accept them (see Fig. 5).

Fortunately, enough postmasters are sufficiently ignorant of the rules to take enough bad IRCs in exchange for stamps to make up for the postmasters who issue bad ones. However, to be sure you're getting your money's worth, make certain the IRCs are properly stamped.

All IRCs are basically identical, as they are still printed by the same firm in Switzerland. Individual countries may ask to have a sales denomination printed in the center, as shown in Fig. 1. Otherwise, the center might be blank. The IRC is stamped on the right when it is cashed in to the post office. Used IRCs are destroyed after a complex accounting system balances purchases and sales between the member countries of the UPU.

Meanwhile, international speculation in IRCs continues. One needs only to glance down the list of sales and exchanges of IRCs to see the problem countries. Most countries have about the same number of sales and exchanges of IRCs. For every one sold, one is cashed in. A few countries stand out with enormous sales and few redemptions—especially the US and Japan. This is to be expected, of course, as the more affluent and more internationally-oriented countries buy and send out the most IRCs (especially hams!).

But countries such as Algeria, Ivory Coast, India, Morocco, and Libya sell hundreds of thousands of IRCs; these countries accounted for close to 20% of all IRC sales in 1981-2, but total redemptions were less than 1% of the biennial accounting! Why? Here is where speculators take advantage of the difference in exchange rate.

Fig. 5. An invalid IRC: it was stamped on the wrong side by the issuing USPS employee.

They fly their thousands of IRCs elsewhere, say, France, making a reasonable profit on the transaction. Since the profit on each IRC is small, these operators must deal with huge quantities of the coupons.

Most countries have established internal systems to eliminate this speculation. A loophole in the UPU regulations permits any member country to limit the sale of IRCs. Most countries simply won't sell you 100,000 IRCs at a crack! So the speculators need a sympathetic postal administration in the country of purchase.

Fortunately, this limits the abuse of the IRC system. Dr. Tuason's concerns notwithstanding, the IRC looks as if it will be around for another 75+ years, providing DXers with a much-needed international exchange medium.

(Special thanks to L. Rubens of the International Bureau of the Universal Postal Union for his invaluable assistance in preparing this column.)

DR. DIGITAL

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PUBLIC DISSERVICE

Not too long ago I was in Carnegie Hall to see Peter Schickele and his orchestra, "The New York Pick-Up Ensemble." I had purchased the tickets at the last minute and had to choose among seats in the balcony, where the view leaves something to be desired.

Just as the performance was about to start, I was shocked to hear the loud high-pitched beeps of a 2-meter repeater's IDer. I looked around to see where this wretched noise was coming from and was able to locate its source! It came from a hand-held radio clipped to the belt of the gentleman seated behind me.

"Please turn your CB radio off," I said to him, in as nice a tone as I could muster. I carefully worded this statement, calling his 2-meter radio a CB, to infuriate him, which it did.

I was not, however, expecting the lecture that followed. He told me that he was performing a public service by providing a medium for emergency communication, carefully wording his statement so as to make one think that he was an undercover peace officer. I informed him that I had stopped "playing policeman" well before I entered kindergarten, and perhaps it was time for him to do the same, especially at his advanced age.

After his radio blared off about three more times, the usher came along and ordered him to turn the radio off or leave. He chose the option of leaving, and the remainder of the audience was able to enjoy the show without the nuisance of some misguided ham performing a "public service."

What reminded me of this story was that recently I was asked to operate a "specialized-mode" station for a local radio club during Field Day. I had to decline the invitation because I had tickets to see the comedian Pee Wee Herman at Carnegie Hall that same weekend. One has to keep one's priorities straight. I am only hoping that, because of Field Day, there will be less of a chance of my encountering another ill-mannered amateur-radio operator.

COMPUTER INTERFACING

Last month we examined one implementation of "memory-mapped" I/O control. Now we will examine another method, employed in the Atari and VIC computers as well as many others.

There are a number of integrated circuits known as input/output chips, or support chips, that are designed to work in conjunction with the 6502 microprocessor. (The 6502 is the microprocessor that both the Atari and VIC computers use.) These chips simplify I/O interfacing and eliminate the confusing conventions that other manufacturers, such as Apple, chose to employ.

The device we will look at is the 6520 peripheral interface adapter, or PIA. This circuit incorporates the circuitry for two I/O ports, each 8 bits wide. For each port there is a "data register" that contains the incoming or outgoing data and a "direction register" that controls whether corresponding signal lines are inputs or outputs. A zero is used to represent an input line and one is used to represent (have you guessed yet?) an output line. The programmer can control which lines are to be used for input or output simply by placing the proper combina-

tions of zeroes and ones in the direction register. Data are then read by examining the data register and are sent to another device by writing to the data register. It is really a fairly simple procedure. The 6520 PIA chip also contains a control register that contains various status signals needed for handshaking, and other bits to control the internal logic configuration.

On the Atari 400 and 800 computers, the data lines from the PIA chip are presented to the outside world via the four "Player Ports" on the front panel. See Fig. 1 for a pinout diagram of each of these ports. Commodore's VIC computers have a similar arrangement. Consult the *VIC Reference Manual* for complete details.

As the 6502 microprocessor has no specific input and output commands in its instruction set, all I/O is "memory mapped," that is, certain memory addresses are set aside for I/O use. If a PIA chip is used in conjunction with a 6502 to control I/O, it too must occupy memory addresses. The 6520 PIA requires four memory addresses; the exact locations of these depend on how the computer system was designed. In the Atari computers, the 6520 PIA is located at memory locations 54016 to 54019 inclusive (hex locations D300 to D303).

Internally, the PIA has six registers: two data registers, two direction registers, and two control registers. Because the PIA uses only four memory locations, it is necessary to have one extra bit to address the proper register. Bit 2 of the control registers serves this purpose. If this bit contains a 0, then the corresponding register is a data register. If the bit is a 1, then the corresponding register is a peripheral register.

Programming the PIA chip is often complicated because the computer uses this chip for its own internal purposes; reconfiguring it may cause the computer to do strange things (all will clear up when the computer is reset, or powered off and on). For example, Atari uses the PIA to control the joystick and stick triggers, the cassette recorder motor (on or off), and whether or not the voice channel of the cassette recorder is sent to the television set. The ability to control a cassette recorder makes it possible to have computer-controlled instructional material supplemented with recorded voice or music. Commands to control a cassette recorder are as follows:

POKE 54018,60 Turn cassette motor off
POKE 54018,52 Turn cassette motor on

The music, voice, Morse code, noise, or any material you have recorded on tape will play through the television set speaker. This technique might be used for a Morse-code or radio-theory computer-assisted learning program.

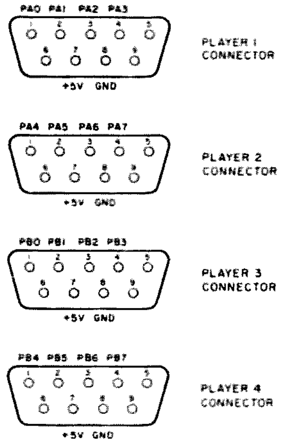

Fig. 1. The four Atari player connectors and the pins that correspond to PIA 6520 connections. The PAn series stands for port A, and the PBn series is for port B. Unmarked connections are used for paddle and stick trigger connections, and are not connected to the PIA chip.

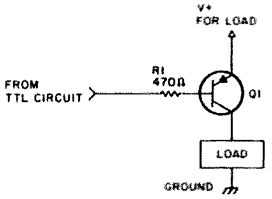

Fig. 2. Connecting a device to a TTL circuit using a PNP transistor.

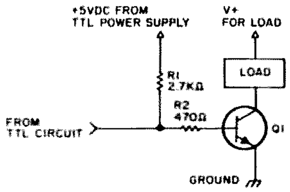

Fig. 3. Connecting a device to a TTL circuit using an NPN transistor.

Location 54018 is the Port A control location for the Atari's PIA. The POKE commands specified above change bit 3 of this register, which corresponds to control line #2, which is used to switch the recorder's power on or off.

This brief introduction to the 6520 PIA was meant to explain how memory-mapped I/O is aided with peripheral control chips. For a complete guide to configuring the 6520, I recommend the book, ***6502 Assembly Language Programming***, by Lance Leventhal (Osborne/McGraw Hill, 1979). Mr. Leventhal explains clearly the internal structure of the chip and provides numerous programming examples of real-life interface problems.

CONNECTING TTL TO THE OUTSIDE WORLD

The output of a TTL chip (such as the 6520 PIA) cannot be connected directly to another device; it simply doesn't have the current-carrying abilities. However, small loads can be controlled with the aid of a PNP or NPN transistor. Choose a transistor with enough current-carrying capability to drive your load. For controlling very large loads, it is recommended that you use either a transistor or an optoisolator. When using a relay, remember to connect a diode in parallel with the relay coil to prevent voltage spikes from ruining the transistor.

Figs. 2 and 3 contain the circuit diagrams for using a PNP and an NPN transistor, respectively. Notice that when using an NPN transistor, a "pull-up" connection is needed. This is because the TTL output must be provided with a current source in order to function correctly.

CONTESTS

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Atco NJ 08004

THE WILDBUNCH 160 SSB CONTEST
Starts: 0000 GMT August 4
Ends: 2359 GMT August 5

This contest is for single operators only.

EXCHANGE:

RST and state, province, or country. Charter members must also give their membership number with the exchange.

SCORING:

Count 10 points per QSO and multiply by the total number of states, countries, and VE provinces. Work any charter member of the Wildbunch for a special multiplier of 1 point each. Work 15 charter members and get a special bonus of 20 points. Work the VE7WCB club station and add 10 points.

AWARDS:

Plaque to the winner and certificates to winners in each state, country, and VE province. Special certificate for working all 30 charter members.

ENTRIES:

Deadline for logs is September 6th, with entries addressed to: R. J. Koziomkowski KA1SR, 5 Watson Drive, Portsmouth RI 02871. To become a member of the 160-meter Wildbunch between June 1st and September 1st, US stations work 10 charter members, DX work 5. From September 1st to June 1st, double the number of QSOs required to 20 and 10. Send log info and US$2.00 for membership certificate and Wildbunch number to Bob LeBlanc KA1FDS, Unity Road, Benton, RFD 1, Box 800, Clinton ME 04927.

ILLINOIS QSO PARTY
Starts: 1700 GMT August 5
Ends: 0500 GMT August 6

Sponsored by RAMS, the Radio Amateur Megacycle Society. Use all bands, CW and phone. The same station may be worked on each band and mode. No repeater contacts are allowed.

EXCHANGE:

RS(T) and state, province, country, or Illinois county.

FREQUENCIES:

Any frequency, but look for most activity; about 40 kHz from low end on CW, and about 3890, 7230, 14280, 21375, and 28675 on phone.

SCORING:

One QSO point per contact or two points if the other station is a Novice or Technician in a Novice band. Illinois stations multiply QSO point total by the total number of states (50 max), VE/VO call areas (10 max), and no more than 5 non-W/K/VE/VO DX countries worked for a maximum of 65 multipliers. Additional DX contacts count for QSO points but not for additional multipliers. Illinois portables or mobiles away from normal QTH may add 200 to final score for each county of operation from which 10 or more contacts were made.

Non-Illinois stations multiply QSO points by the number of Illinois counties worked. Only Illinois stations may be counted for QSO points. Non-Illinois stations may also take extra bonus multipliers for each group of 8 QSOs with the same county.

AWARDS:

Certificates to the top 3 Illinois scorers in Single op, Multi-op, portable out-of-home-county, mobile, Novice, and CW Technician categories. For out-of-staters, awards go to top scorers in similar categories in each state, province, or country

CALENDAR

AUG 4-5	**ARRL UHF Contest**
AUG 4-5	**Wildbunch 160 SSB Contest**
AUG 5-6	**Illinois QSO Party**
AUG 11-13	**New Jersey QSO Party**
AUG 18-19	**SARTG Worldwide RTTY Contest**
AUG 24-27	**A5 North American UHF FSTV-DX Contest**
AUG 25-26	**Occupation Contest**
SEP 1	**DARC Corona 10-Meter RTTY Contest #3**
SEP 8-9	**ARRL VHF QSO Party**
SEP 15-16	**Ohio QSO Party**
SEP 15-17	**Washington State QSO Party**
SEP 21-23	**Maine QSO Party**
SEP 22-23	**Late-Summer QRP CW Activity Weekend**
OCT 6-7	**ARRL QSO Party—CW**
OCT 13-14	**ARRL QSO Party—Phone**
OCT 13-14	**Rio CW DX Party**
OCT 13-14	**Columbus Day International DX Contest**
OCT 13-15	**Oregon QSO Party**
OCT 20-21	**Jamboree on the Air**
OCT 20-21	**Worked-All Y2 Contest**
NOV 3	**DARC Corona 10-Meter RTTY Contest #4**
NOV 3-4	**ARRL Sweepstakes—CW**
NOV 17-18	**ARRL Sweepstakes—Phone**
DEC 1-2	**ARRL 160-Meter Contest**
DEC 8-9	**ARRL 10-Meter Contest**
DEC 26-JAN 1	**QRP Winter Sports—CW**
DEC 30	**Canada Contest**

NEWSLETTER OF THE MONTH

This month the laurels go to Editor Al Berg WB7SIC and *OTVARC*, journal of the Oregon Tualatin Valley ARC. Al tries very hard to include items of interest for everyone—a tough job in a club with 230+ members! The result is a collection of news and views presented in a friendly, easygoing style with eye-catching graphics that grab a reader's attention.

OTVARC is obviously a dynamic group of people who thrive on a steady diet of ham radio, social events, and public service. Congratulations to President Dave Parker W7LJN, Vice-President John Haide WA7CZA, and their fellow OTVARCs for doing it better than anyone else.

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

RESULTS

1984 VIRGINIA QSO PARTY

Winners of major award plaques:
Virginia fixed station—WA4NTP (78,921), Virginia mobile station—WA4PGM/M (63,800), Virginia CW only—KØRI (42,028), Virginia QRP station—KW4I (13,608), Out-of-state station—NC2V (7,590).

State winners (24 states)

AL—WA4VEK	ID—KA7T	MI—W8WVU	OK—KJ9R
AZ—W7YS	IL—KY9F	MT—KA7PMU	PA—W3ZX
CA—W6NNY	LA—W5WG	NC—K4JEX	TX—W5PWG
CT—K1BV	MA—WA1REI	NJ—NC2V	WA—W7DRA
FL—WK4F	MD—K3LK	NM—AI9X	WV—W3IJT
IA—KØHQE	ME—KA1ZV	NV—KA7GXO	WY—NC7O

DX winners: Canada—VE3KK; Spain—EA2IA.

from which 2 valid entries are received. Please send in even low-scoring logs to help another meet the two-log rule. Decisions of the contest committee are final.

ENTRIES:

Logs must be legible and be submitted along with a summary sheet listing all claimed multipliers and calculations of score. Operator(s) name, address, call, and operation category must be typed or printed clearly. Include a business-size SASE for return of results.

Entries must be postmarked no later than September 1st and sent to RAMS/K9CJU, 3620 N. Oleander Avenue, Chicago IL 60634.

NEW JERSEY QSO PARTY
2000 GMT August 11 to 0700 GMT August 12
1300 GMT August 12 to 0200 GMT August 13

The Englewood ARA invites all amateurs worldwide to participate in the 25th annual New Jersey QSO Party. Phone and CW are considered the same contest. A station may be contacted once on each band; phone and CW are considered separate "bands" but CW contacts may not be made in phone-band segments. NJ stations may work other NJ stations.

EXCHANGE:

QSO number, RS(T), and ARRL section, country, or NJ county.

FREQUENCIES:

1810, 3535, 3900, 7035, 7135, 7235, 14035, 14280, 21100, 21355, 28100, 28610, 50-50.5, and 144-146. Suggest phone activity on the even hours; 15 meters on the odd hours (1500 to 2100 GMT); 160 meters at 0500 GMT.

SCORING:

Out-of-state stations multiply the number of complete contacts with NJ stations times the number of NJ counties worked (21 maximum). NJ stations count 1 point per W/K/VE/VO QSO and 3 points per DX QSO. Multiply total QSO points by the number of ARRL sections (including NNJ and SNJ—maximum 74). KP4, KH6, KL7, etc., count as 3-point DX contacts and as section multipliers.

AWARDS:

Certificates will be awarded to the first-place station in each NJ county, ARRL section, and country. In addition, a second-place certificate will be awarded when 4 or more logs are received. Novice, Technician, and mobile-operator certificates will also be awarded.

ENTRIES:

Logs must show date/time in GMT, band, and emission. Logs must be received not later than September 8th. The first contact for each claimed multiplier must be indicated and numbered and a check-list of contacts and multipliers should be included. Multi-operator stations should be noted and calls of participating operators listed. Logs and comments should be sent to Englewood Amateur Radio Association, Inc., PO Box 528, Englewood NJ 07631.

A #10 (business) size SASE should be included for results. Stations planning active participation in NJ are requested to advise the EARA by August 1st of their intentions so that they can plan for full coverage from all counties. Portable and mobile operation is encouraged.

SARTG WORLDWIDE RTTY CONTEST
Contest Periods:
0000 to 0800 GMT August 18
1600 to 2400 GMT August 18
0800 to 1600 GMT August 19

This is the 14th annual contest sponsored by the Scandinavian Amateur Radio Teletype Group (SARTG). Operating classes include (a) single operator, (b) multi-operator/single transmitter, and (c) SWL. Please note the logs from multi-operator stations must contain the names and callsigns of all operators involved. The same station may be worked once on each band for QSO and multiplier credits. Only 2-way RTTY QSOs will count.

EXCHANGE:

RST and QSO number.

SCORING:

QSOs with your own country count 5 points. Other countries in the same continent are 10 points. Other continents are 15 points. In USA, Canada, and Australia, each call district will be considered as a separate country. Use the DXCC list and the above-mentioned call areas for multipliers. Note that contacts with a station which would count as a multiplier must be found in at least 5 logs or a contest log must be received from the multiplier station in order to be valid. Final score is the sum of QSO points times the sum of the multipliers. SWLs use the same rules for scoring, but based on stations and messages copied.

AWARDS:

Top stations in each class, country, W/K, VE/VO, and VK call district if the number of QSOs is reasonable.

ENTRIES:

Logs must be received by October 10th and should contain: band, date/time in GMT, callsign, exchanges sent and received, points, multipliers, and final score. Use a separate sheet for each band and enclose a summary sheet showing the scoring, classification, callsign, name, and address. In the case of multi-operator stations, include the names and callsigns of all operators involved. Comments will be very much appreciated by the contest committee. Send logs to: SARTG Contest & Award Manager, C. J. Jensen OZ2CJ, PO Box 717, 8600 Silkeborg, Denmark.

OCCUPATION CONTEST
Starts: 1800 GMT August 25
Ends: 2400 GMT August 26

The Radio Association of Erie, Pennsylvania, is sponsoring its annual contest, open to all amateur radio operators.

EXCHANGE:

RS(T); occupation; and state, province, or country.

FREQUENCIES:

CW—40 kHz from the bottom of the ham bands; phone—3920, 7250, 14300, 21400, and 28600.

SCORING:

Score 3 points for each new occupation worked, one point for all similar occupations worked, and 2 points for all retirees worked. There are no multipliers.

ENTRIES:

Mailing deadline for logs is October 1st, and they are to be sent to Harry Arsenault K1PLR/3, 603 Powell Avenue, Erie PA 16505. Enclose an SASE for a copy of the results.

CORRECTIONS

Re: "Painless Op-Amp Filter Design," April, 1984: The article contains a major technical error. All claims with reference to the gain characteristics of the bi-quad filter should be ignored. The erroneous interpretation of data acquired from breadboard models of the bi-quad resulted from too literally interpreting sources that list the gain of the bi-quad filter as its Q. This is true only for the design center frequency for normalized models. Examination of the transfer function for the bi-quad shows a relatively flat gain even for wide-frequency-range filters, such as those shown in the original article. Greater ranges of gain may be expected for variable-Q models. The measured results for breadboard models are in close agreement with or greater than predictions from the transfer function. The remaining design techniques, especially for determining the tuning range, still apply. For variable-output-level filters, an output-leveling technique is useful in many applications. I sincerely regret the error and offer my thanks to Frank W. Heemstra for pointing it out.

L. B. Cebik W4RNL
Knoxville TN

REVIEW

AMTORSOFT FROM KANTRONICS

All the talk over the past year or so about AMTOR left me a little bewildered. I even did my homework and looked up several articles on the subject to see if I could teach my Commodore computers how to speak AMTOR. About all I accomplished was to get myself totally confused! Modes of transmission that I can't decode bug me until I understand them. AMTOR is no exception.

I was relieved when Kantronics agreed to let me take a look at their AMTORSOFT program. Finally, I would find out what all that "chirping" is about!

The AMTORSOFT package works in conjunction with your home computer and a terminal unit or computer interface. The particular package I reviewed was designed for the VIC-20 and the Kantronics Interface II.

Throwing caution to the wind, I did what any self-respecting amateur would do. I hooked up the interface, did a system call to activate the software, and threw the instruction book on the bench! *That* was not a good idea!

The Kantronics folks had enough insight to include not only a very thorough instruction manual for the software, but also an overview of AMTOR itself for the uninitiated like me. Unless you have actually seen AMTOR work, please read the book first.

My previous reading about AMTOR had taught me that there are two forms of transmission: Mode B (the broadcast mode) is the form developed for transmission of general-interest bulletins and such. In Mode B, the signal sounds very similar to ASCII transmissions. No chirping takes place. What I hadn't read was that other than for ARRL bulletins, almost no one ever uses it!

I mistakenly selected mode B from the software menu and was disappointed that I could never seem to make anything print. That was my first hint that I should read the instructions.

I finally figured out that I needed to be in the L or listener mode if I wanted to eavesdrop on AMTOR conversations. The AMTORSOFT package provides you with several software LEDs, as I choose to call them, to let you know when you are successfully locked to an AMTOR signal. These indicators are labeled L, V, X, and I. A solid block displayed below the L indicates that you are locked or in synch with an AMTOR signal. The battle is half won! The V indicates that you are receiving valid AMTOR characters. The block below the X only comes on when you are transmitting, and the I block flickers on from time to time to indicate that the station you are receiving is sending idle characters—something like RTTY diddle.

After some patience and learning the hard way that it may take ten or more seconds for even a properly-tuned signal to lock, I started seeing my first AMTOR copy.

For those of you totally unfamiliar with AMTOR (or who are like me and forget everything you read), suffice it to say that the transmissions occur in three-character blocks. If a block is received OK, the next three-character block is sent. If the receiving station doesn't acknowledge that a valid block has been received, then the transmitting station keeps sending it until it is acknowledged. With that in mind, consider what happens when you eavesdrop on a conversation.

Since you are not an active participant in the QSO, you have no way of telling the transmitting station whether you have received the information or not. This can result in some strange copy at your end. Let's say the transmitting station is sending: K9EI K9EI DE WB9YJC WB9YJC. Suppose that just as the transmission begins, a bad static crash wipes out the first three characters for the intended station, but doesn't affect your reception. If it takes three tries before the intended station acknowledges those first three characters, and then everything goes smoothly, your screen might look like this: K9EK9EK9EI K9EI DE WB9YJC WB9YJC.

If during the transmission you receive invalid or no information, your screen will simply remain blank until the next valid set of characters is received.

The next problem I encountered was that of stations calling CQ. To put it simply, they don't! Not in the traditional way, at any rate.

Old-time RTTY people may be familiar with selcal or selective calling. On mechanical machines, it is possible to program an on/off sequence that will respond to a certain four-letter code. For general purposes, NNNN is frequently used. On AMTOR, a similar system is used. A station wishing to call CQ will continually transmit a four-letter block which sometimes consists of CQCQ or perhaps a shortened form of the originating station's callsign. For example, I might use KKEI or WYJC. A receiving station can lock to this selcal and respond only when this particular code is seen. The AMTORSOFT package will display this selcal for you so that if you desire, you can lock to the transmitting station. Entering a null character group will lock to any received selcal.

In fairness, I must say that on my second day of operation, I did find that some stations use the B mode and actually do send CQ, but the majority simply start up with the CQCQ selcal. In such a case, the locked and valid indicators will come on, but your screen will print nothing. A word to those operators calling CQ in this manner (who I heard go on for 30 minutes or more without ever sending an ID). You better watch out. Though CW ID is no longer required, you do have to identify, and your four-character selcal won't meet the requirement.

Actual two-way QSOs with AMTORSOFT can be a joy once the initial contact is established. Due to requests for repeats on character groups, a normal AMTOR QSO speeds along at about the same rate as 60-wpm RTTY. If a lot of repeats are necessary, the QSO can go slowly, but quite accurately.

Something that must be contemplated when setting up your station for AMTOR is the switching time of your transceiver between transmit and receive. Most modern transceivers will work well, but if you are not sure, check before you buy.

Another problem I had not considered is that most power amplifiers cannot respond quickly enough to meet the AMTOR timing requirements. The instructions with AMTORSOFT state boldly that operation with a linear should not be attempted.

That certainly explains that while I could find some very strong RTTY signals on 20 meters, all of the AMTOR transmissions were down 12 dB or more. Everyone is running in the 50-Watt or so range!

A beautiful example of how effective AMTOR can be is a QSO I monitored between an east-coast station and a maritime mobile station off the coast of South America. Both were using the AMTORSOFT package. The QSO began with both stations at about 50 Watts. Both stations kept reducing power until each was running under five Watts. From my listening, it was apparent that the QSO was solid with a minimum of repeats. Anybody want to try for an AMTOR QSO using an HW-8?

I finally did get to copy the W1AW bulletins on mode B. Of course there is no allowance for feedback to the transmitting station, so each group of characters is sent twice. The software determines whether one of the character blocks received is valid and prints only the valid one. If invalid data is received both times, garbage is not printed—rather blank spaces are sent to the screen or printer. During an approaching thunderstorm, my copy of the bulletins was nearly letter perfect, with only three blank spots during the whole 30-minute transmission. The Teletype* bulletins at the same time were a disaster.

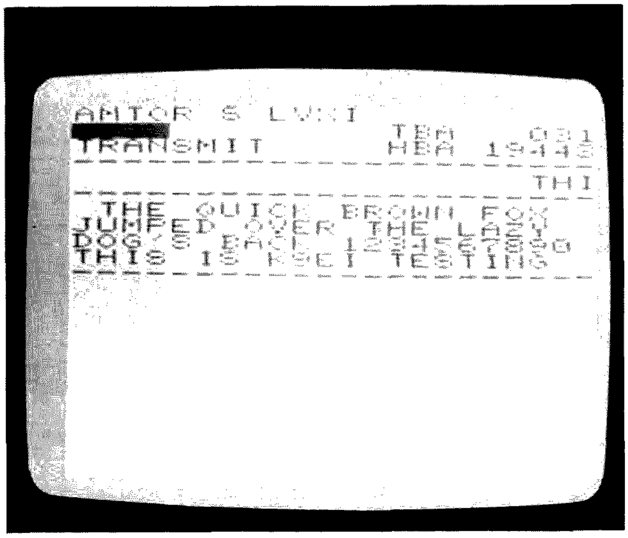
AMTORSOFT has all of the text-holding and editing features of HAMTEXT, the CW/RTTY/ASCII package available from Kantronics. Those features have been detailed in several reviews elsewhere, so I won't go into them here. The software contains the equivalent of a mini word processor and will allow you to store received messages in a buffer, save them to disk or to tape, edit, and resend them.

The AMTORSOFT package receives and sends AMTOR only, though Kantronics has a special version of HAMTEXT with AMTOR that combines both packages.

It seems to me that AMTOR is a godsend for the serious QRP enthusiast who is interested in doing RTTY-type things. AMTORSOFT is just another in a string of excellent software packages from Kantronics, priced at $89.95 list. It is highly recommended.

For further details, contact *Kantronics, 1202 East 23rd Street, Lawrence KS 66044.*

Jim Grubbs K9EI
Springfield IL 62708



The AMTORSOFT screen as generated by a VIC-20. Note in particular the dark rectangle in the upper left hand corner for displaying selcal. The software LEDs (LVXI) are located just above and to the right of the selcal block.

AEA MBATEXT SOFTWARE

The power of computer world processing has come to amateur radio! The AEA software packages for the VIC-20 and Commodore 64 computers offer a very versatile approach to several modes of amateur transmission.

Known as MBATEXT for Morse, Baudot, ASCII, these software packages transform your Commodore computer into a state-of-the-art communications terminal. There are so many features included in MBATEXT that it is difficult to find a starting point.

MBATEXT comes as a plug-in cartridge, much like the ones used for computer games. In order to access the program, a SYS (system) command is used. This allows you to call the program from your own Basic program. If, for example, you wish to use other than the default screen and text colors, you can write a brief program to set them to your own choices and then call MBATEXT.

Once you have entered the program, everything is menu-driven. You are presented with several choices from the main menu. As you make selections, you may encounter additional detailed menus at any time. Before concentrating on the operation of MBATEXT for transmission and reception, let's look at the common text-editing system.

Those of you familiar with regular word processing would expect a program to provide several different functions. First, you should be able to enter text on the screen and edit it to correct mistakes. Second, you should be able to save and load text files to and from cassette and disk. Finally, you should have the ability to print your file.

MBATEXT does all of this and much more! The text storage area has been designed with several different buffers. The size of these buffers is user-selectable up to the limit of available memory.

Ten buffers are available for programmed messages of your choice. These messages can be saved to tape or disk so that you can reload them when you first start the program. Incoming text, whether it be CW, RTTY, or ASCII can be saved in a receive buffer. It is possible to use the text editor to revise the text so that you can print or save just exactly the parts you want. Someone active in traffic handling can use this feature to great advantage, eliminating the need to manually transcribe and resend messages.

An audible "keyclick" is available if de-

sired to give you an indication that you actually have hit a key on the keyboard. Many operators find that this improves the accuracy of their typing.

Regardless of the mode you are operating, a transmit buffer is available so that you can compose an outgoing message while you are receiving messages. Even when you are on line and sending, you can type ahead of the text being sent. That's a real advantage when you are sending at slower CW speeds.

In the CW mode, you can select speeds up to 99 words per minute. It is really only necessary to set the transmitting speed; the receive speed will track the incoming signal automatically. It is really something to watch the speed indicator track the W1AW code-practice transmissions.

The screen is split into three sections: received text, transmit buffer, and a single line of outgoing text.

When MBATEXT is fed a signal from a compatible interface such as the AEA CP-1, it does an excellent job of receiving. CW transmission is very clean with perfect machine-generated code. At speeds between 5 and 14 words per minute, Farnsworth spacing is used. Individual characters are sent at about 15 words per minute with the spacing between characters increased to slow down the overall rate.

Several additional options are available. You have the choice of character or word mode on transmit. By selecting the word mode, transmission is held up until a space is encountered, and then the whole word is sent. That's particularly helpful for two-finger typists who make a lot of mistakes. Your errors can be corrected before they are sent!

You also have the option of selecting the break-in mode. The program automatically toggles between send and receive. What you lose is the use of the transmit holding buffer.

A Morse-code fill option can be selected. It is the Morse-code equivalent of RTTY diddle (sending null characters). If selected, the program will automatically send BT while you try to think of something to say. I didn't find that option very worthwhile.

Most of the features for RTTY and ASCII are similar since they are similar modes of transmission. Standard RTTY speeds of 60, 67, 75, 100, and 132 words per minute are included with ASCII speeds of 110 and 300 baud.

An unshift on space (USOS) option is available and can be handy when copying weak signals. One particularly nice touch is the RTTY "speed guess" mode. If you aren't sure at what speed the RTTY is being sent, this can be used to get you in the ball park. It isn't foolproof. Usually the average of several guesses gets you close.

AEA has included several keyboard overlays to help you keep track of what the function keys do, what you have stored in your message buffers, as well as where to find the special characters. It sure beats checking the instruction manual every time you forget.

MBATEXT will support printing to either a VIC-type printer (1525, 1528, MPS 801, etc.) or a Centronics-type parallel printer. A time-of-day clock at the top of the screen keeps you on schedule.

Operation with MBATEXT is a pleasure. Old-time RTTY tape splicers will find it to be the greatest thing since the spark gap.

AEA offers one-year support on the software that is even transferable should you decide to sell MBATEXT before the warranty is expired. MBATEXT is state-of-the-art software that would be a welcome addition in any hamshack.

For AMTOR enthusiasts, AEA offers MBATOR—which includes all the features of MBATEXT plus AMTOR, along with some additional MBA features.

For more information, contact *Advanced Electronic Applications, PO Box C-2160, Lynnwood WA 98036.*

Jim Grubbe K9EI
Springfield IL 62708

TIMEX/SINCLAIR 1000: ASTRONOMY ON YOUR COMPUTER

This book (by Burgess and Burgess) might, on the surface, seem like a pretty strange topic for an amateur-radio publication. However, the computer programs presented in the 17 chapters of this little text have a lot to offer amateurs. But first things first. The book is published by Sybex, Inc., 2344 Sixth St., Berkeley CA 94710, and is 176 pages. (You can check on the current price with Sybex—it is modest.) Sybex offers a companion text that presents a collection of astronomical programs in Basic which are adaptable to a wide range of computers. It is *Celestial Basic*, by Eric Burgess (300 pages). The latter may interest hams with computers other than the Timex/Sinclair models.

Several chapters in the *Timex/Sinclair Astronomy* text are sure to interest amateurs. Chapter 2 presents a program that converts local time to sidereal or sidereal to local mean time. Chapter 7 has a program for the right ascension and declination of the moon. Chapter 8 computes the time of rising, transit, and setting of the moon. All of these programs are sure to interest moonbounce fans. A nice touch found in every program is the ability to set the latitude and longitude for your own QTH or for any other location on Earth. This would be a big help in coordinating schedules with other hams, since you can use the computer to search for common windows.

Chapter 15 has an interesting program for DX fans. It provides a method of computing the time of rising, transit, and setting of the sun. This will help in the identification of local conditions as well as those of a DX location on any selected date. Using the program, you can identify sunrise and sunset periods in the search for openings.

The rest of the text has a lot to offer for non-ham applications as well. There are programs to help identify constellations. One shows the location of the sun, moon, and planets at any time on any date. Another helps select the exposure for photographing astronomical objects. All in all, this is a very useful text.

The authors have done a very good job in presenting their programs in a clear and readable fashion. The output from sample runs is presented to clarify the goals of each program. Surprise—there is even an index—something that is left out of far too many low-cost computer books (and some no-so-low-cost books, too).

My overall evaluation of the text is highly complimentary. The book should appeal to hams with a general interest in relating astronomy to their ham activities. The text will be fascinating to those of us who find astronomy interesting in its own right. One caution—the programs are long and you must have at least 16K of memory to make them fit. There should be no problem in the conversion to other machines, for those interested.

Finally, there is one minor feature that I would like to have seen in the Sybex text, as well as in other books. I wish that the publishers had used a spiral binding. I have to hold one side down with my D-104 and the other with my Ten-Tec keyer. Otherwise I lose the page. Come on Sybex—let's be more considerate of the poor computer owner who has to hunt and peck as well as hold the book down with both elbows.

For more information, contact *Sybex, Inc., 2344 Sixth Street, Berkeley CA 94710.* Reader Service Number 482.

Thomas M. Hart AD1B
Westwood MA 02026

WHAT DO YOU THINK? ICOM 751 AND KENWOOD TR-2500

In December, 1983, you printed a very brief review on the Icom 751. I bought mine in March, 1984, after looking at all the competition. The review was very conservative at best. The radio is the greatest HF rig for the money that I have seen in years. By removing 1 wire (mute), it covers MARS and CAP use also. It took me two days of reading the manual to really become proficient with all its capabilities. I worked LU5AMF on 20 barefoot from my QTH in northern Japan—that's 17,000 km and pretty good considering my antenna is a HyGain 18AVT/WB vertical. Critical notes: S1 and S2 on the main board are for RTTY polarity and shift, respectively, but are inside the rig! I hope Icom will correct that and put them where they are readily available. I use the PS35 internal supply and 500-Hz FL-52 filter with it. It works great on RTTY also. If you need a good, small, neat HF radio for amateur, MARS, mobile, and RTTY, I think the 751 is just the rig.

In June, 1982, you reviewed the Kenwood TR-2500 and 3 months later I bought one. I have used mine in all kinds of weather (lots of snow and ice) and it works like a champ. It has been dropped on ice and concrete and it keeps right on working. I wrote to Kenwood and purchased the service manual at a reasonable price. To my surprise, the manual covers all the accessories, too. Critical comment: The speaker mike connector easily works loose and you have to keep pushing in the plug (which was not appreciated when I was hanging from a 60-ft. pole working on the repeater antenna). The TR-2500 will be a hard HT to beat for the money with the versatility that it has.

The above are the only two new radios that I have bought in over 17 years. I am very picky about what ham radios I buy. Now if I could only decide about what computer to buy.

MSgt. Robert S. Burch WA2ILU
APO SF 96519

WHAT DO YOU THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

✓ See List of Advertisers on page 98

LETTERS

OLYMPIC TRIUMPH

When the US Olympic Committee selected Olympia, Washington, to be the site of the US Olympic Women's Marathon Trials on May 12th, 1984, the local amateur radio club, the Olympia Amateur Radio Society (OARS), created a committee to interface with the task force running the marathon. As chairman of this committee, I found this assignment quite difficult for several reasons. Our job was to teach the marathon task force about amateur radio's utility in this kind of endeavor, find out what they would need, create a structure to provide the services required, and direct whatever communications effort was needed. The Women's Marathon Task Force was divided into about fifteen committees, and getting them to understand our unique communications capabilities was very difficult.

The task force's assessment was that there might be 100,000 people trying to view the event, and they did their planning on that basis. Olympia is a relatively small town and there was no way 100k people could see the finish or even see the last few miles of the race. The task force also did not know what events they would host for the runners prior to and after the race itself, what demands the media would make of them, how much support they could get from the community, how they would handle traffic...their assignment was incredible.

After a great deal of study, the marathon task force directors determined that their greatest need for our services would be during the race itelf, to provide to the race announcer and to the various media the position and time information on the progress of the race. (We might also have been assigned course security duty, but the US Olympic Committee was sending a 500-MHz Motorola system with 40 handhelds and a base station of the type to be used during the summer Olympics. This Motorola system and the State Patrol, Sheriff, and City Police systems would be the backbone of their security system.)

Initially, we planned to provide position and "splits" (time since the race began) for the race announcer and records people at each milepost of the 26.2-mile course. That would have meant 25 hams and timers on the course, plus net controls at the finish line. That was easy. However, a few weeks before the event we were asked if we could enlarge the system to also provide information from 1/2-mile points, from the the mid-race point, from the 1-mile-to-the-end point, and could we put someone in the pace car and on the ABC-TV truck? Also, could we put operators in the ABC-TV vans at the starting line (to remotely start 25 timers' watches at all of the 25 mile-markers), and in the Thurston County Communications Center (Medic-1, 911, etc.), and "there may be a few last-minute additions..."!

The OARS Committee designed the system we would use, taking input from everyone we could find. We would have two nets, one on two meters and one on 220, both on available county-wide-coverage repeaters, and we would alternate assignments. Thus, the one-milepost operator was on two meters, the two-milepost operator was on 220, etc. There were not enough operators in the Olympia area, for our operator needs were now around 60, with each operator asked to supply a timing helper.

We called the nearby clubs, the Mason County Amateur Radio Society and the Radio Club of Tacoma, Inc., and got the needed additional people. We tried to be fair. While none of the tasks was "dirty," some might be construed to be more "glamorous" than others, and we assigned the "glamorous" tasks evenly between the three clubs.

We found that the volume of data we would be collecting was too large to handle and compile using a paperwork system, so we developed a computer system to collate and distribute the data. This system evolved into a set of Radio Shack model 4s acting as dumb terminals driven by one model 4. We ended up with a 700-foot RS-232 run at 1200 baud, working perfectly, although we had full-duplex modems if we needed them.

The marathon task force wanted the positions and times on the first eight runners and selected "ones to watch." This meant about a dozen positions and times coming to the computer typist from the two nets. The net format was carefully designed to minimize repeating data and was a near-copy of the Navy MARS format. It demanded that after each position and time was reported, the net control acknowledged that piece of information. It worked perfectly.

ABC-TV was having a considerable impact on the information the marathon task force wanted us to provide and I was having some reservations about the legality of our plans. Would we be de facto news reporters? I called the Engineer-in-Charge of the Seattle FCC field office who referred the question to an attorney in the Personal Radio Section in Washington, D.C., and we had a 3-way conference call. The attorney was most helpful, observing that our prime objective was to provide the course announcer with information and that no remuneration was coming for our services. He contended that we were OK as long as no amateurs were placed on the air broadcasting race information directly. Our data was going into a computer which was creating a delay, albeit small, and we were "grinding" on the data, adding to the number we put in from the racer's shirt, her name, creating a split time and "elapsed-time-to-finish-at-this-pace" time, for display to the announcers. The two operators assigned the ABC-TV trailers were not to transmit information requests.

The weekend before the race we held a meeting for all the amateurs who would be participating. We handed out a course-operator location sheet, a map showing the precise location of each milepost, an instruction sheet, and a timer sheet with the net format. We went over the timing process and the net reporting process. Then each operator went to his/her location to make sure he/she knew where it was and checked the radios through the repeater at that location for any dead spots. We let the assembled multitude know of a possible major change: The FCC Special Temporary Authority (STA) requested by the marathon task force allowing use of the 500-MHz radios for the security team had been disapproved...it seemed that the system might cause interference with a low-power religious TV station 40 miles away! The marathon task force had Washington State Senator Slade Gorton trying to reverse the FCC and was scrambling for unused Department of Natural Resources (fire-fighting) radios as a backup in the meantime. But—if worse came to worst—one of our nets would become the security system! As it turned out, the security team borrowed enough DNR radios to do the job, but they did not get about 6 of them back. They were left on the sidewalk by the "security" people, or "lost..."

The amateur we had assigned the task of riding with the ABC-TV camera truck reported that rf from ABC-TV's own radio system and its CB radio, in the vicinity of the truck, would make the special gyro-stabilized camera mount go bonkers. The camera crew had been working two days to try to RFI-proof the mount, and when I went to check they looked a little bedraggled. We found that the 220 Icom 3AT didn't upset the mount, and the Icom 2AT did, only slightly, when on high power and right next to the mount. Eventually the camera crew managed to seal the mount from the RFI effects, and we mounted our mag-mounts on the other end of the truck and hoped for the best.

We borrowed a new 29-foot travel trailer from a local dealer and got it into position two days before the event, with 200-Amp service. We installed a copier borrowed from another dealer as a backup in case the computer system we'd developed didn't work. The copier was never turned on! The day before the event we installed the computers and radios and did a trial of the system the night before the event.

Race day came. As the position operators checked in, it became apparent that everyone had showed up—all 60 operators were in position! The town filled with spectators. Eight helicopters and several fixed-wing planes circled overhead at the start. The ham at the start transmitted the starting gun on both 2 and 220, and the 25 timing watches were started.

The runners set a blistering pace—five and half minutes a mile or better, and as they went by the first milepost they were reported to be chatting with each other... for them it was a Saturday 26.2-mile cakewalk! Our data began coming in and went into the computer and out to the course announcer 300 feet one way, to ABC-TV 700 feet another way, to KOMO-radio 700 feet another way, and to the press area near us (we were 140 feet from the finish line).

The race took two hours, thirty-one minutes, three seconds, for its winner, Joan Benoit, but much longer for its last-place runner, who was about halfway around as Joan finished. As runners dropped out, they came to our operators with requests for aid or for trainers to pick them up. These requests we relayed to the medical community or the racers' support areas.

After the race we held a brief evaluation meeting with the race directors—who were uniformly overjoyed with our operation. ABC-TV's comments were that they had never seen such a volume of data. While they had about 17 cameras and mostly operated real-time, they were impressed with our computers and with the smoothness of our system. As a result of this and other equally fine efforts by the 2800 volunteers from all over the state, we may get to do it again...in four years!

My suggestions for anyone planning such an event are that you try to conceive the eventual system months ahead. Sit around and brainstorm. Plan for a worst-case set of circumstances. If you do an event like this, create a notebook with a page for every milepost and position, where every change can be noted. Have permission from the repeater owners in writing, in advance of the operation, and have backups for everything, including people, equipment, and systems. Overdo it if possible. Give several people the task of documenting your efforts. Assign a cleanup committee to help tear down your system after it is over. Give credit to everyone—write letters of appreciation to anyone you borrow from on the most official stationary you can get! Take all credit and all criticism with a grain of salt. Have fun, and good luck!

Lee Chambers WB7UED
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Olympia WA 98502

AWARDS

MT. DAVIS DXPEDITION

The Somerset County Amateur Radio Club will sponsor its third annual DXpedition to the highest point in Pennsylvania, Mt. Davis, from August 4th at 1400 EDST to August 5th at 1400 EDST.

Frequencies are the upper 25 kHz on the General portion of the bands and CW in the Novice portion, with 80 meters being used after nightfall and 40 meters during the day. Each contact wishing to receive a beautiful certificate must send a 4½" x 9" or larger envelope. Send to: Box 488, Somerset PA 15501.

JERSEY SHORE ARS

The Jersey Shore Amateur Radio Society will operate KF2T at the Oyster Creek (NJ) Nuclear Generating Station between 1400Z Saturday, August 4, and 1800Z Sunday, August 5. Phone operations will be near 3930, 7270, 14270, 21270, and 28570 kHz. CW/Novice-Tech 30 kHz from lower band edges, VHF on 146.58. RTTY on 3640, 7080, and 14080. A special photo QSL is available for an SASE to JSARS, 819 17th Avenue, South Belmar NJ 07719.

THE BIRTHDAY BEAR

The Bemidji Amateur Radio Club, using the call KC0MJ, will be commemorating Smokey the Bear's birthday at the home of Paul Bunyan and Babe the Blue Ox on August 11th and 12th, from 1400Z to 2200Z. Operating frequencies will be 10 kHz up from the lower edge of the General-class phone bands on 20, 40, and 80 meters. To receive a special tri-color certificate, send an SASE, size 9" x 12", to Bemidji Amateur Radio Club, PO Box 524, Bemidji MN 56601.

PARAMUS NJ

The Bergen Amateur Radio Association

will operate K2TM from 1500Z to 2400Z August 18–19 to celebrate the club's 21st anniversary. Frequencies: 7.235, 14.275, 21.375, 28.675, 146.520. Novice: 7.125. Certificate for large SASE and QSL via K2UFM, 31 Forest Drive, Hillsdale NJ 07642.

WAG AWARD

The Worked All GARC or WAG award is given free to any amateur-radio operator who can submit written confirmation (QSL cards) of at least one two-way contact with each of twenty (20) or more members of the Gabilan Amateur Radio Club (GARC). The award consists of an attractive certificate suitable for framing and one bulb of fresh locally-grown garlic. Contacts may be made on any band or mode or combination of these.

The Gabilan Amateur Radio Club was founded in 1979 and draws its membership from the area surrounding Gilroy CA. This includes cities in the Santa Clara, San Benito, Santa Cruz, and Monterey County areas such as Salinas, Hollister, Morgan Hill, Castroville, and San Juan Bautista. The area lies on the fringe of Silicon Valley, south of the San Francisco Bay, but its primary industry is agriculture, including the growing and processing of garlic. The city of Gilroy sponsors an annual Garlic Festival, and this award is in keeping with that spirit.

Award submissions should be sent to the GARC Secretary, PO Box 2178, Gilroy CA 95021-2178. QSL cards will be returned only if accompanied by sufficient return postage. For a current roster of GARC members, send an SASE to the GARC Secretary at the address given above. To be valid for this award, stations must be members of GARC at the time of the contact, but need not be members at the time of the award submission.

ABC RADIO CLUB

The Amateurs for Better Communications (ABC) Radio Club of northern Illinois will operate KA9KOL on August 18–19, 1984, from 1700Z to 2300Z at the site of Lindenfest 84. Lindenhurst, a northern Illinois community and part of the gateway to the lakes region, will celebrate its second annual community festival. Look for KA9KOL on 7.240 to 7.245 and/or 14.280 to 14.285. QSL SASE to Terry Drews KA9KOL, 37328 N. Fairview W Lane, Lake Villa IL 60047.

SPACE DAY '84

The Cascades Amateur Radio Society (CARS), in conjunction with the Michigan Space Center in Jackson, Michigan, is offering a Space Day certificate to all stations who work WB8CSQ during Space Day activities. Look for WB8CSQ on 3.900, 7.235, 14.285, 21.360, and 28.510 starting at 0000 GMT August 18 through 1700 August 19. A one-dollar contribution is asked to cover cost of postage and materials. Mail your log information and $1.00 to CARS, Space Day '84, PO Box 512, Jackson MI 49204.

FOX RIVER RADIO LEAGUE

The Fox River Radio League will be operating a special-event station to celebrate the FRRL's 60th year of continuous operation. The FRRL will be operating from the Kane County Fairgrounds, St. Charles, Ilinois, on August 26, 1984, from 8 am until 4 pm (CDT) using the FRRL callsign W9CEQ. Suggested frequencies are 10 kHz up from the lower portions of the General-class phone bands on 40, 20, and 15 meters.

For a certificate or QSL, send your QSL and an SASE to: Fox River Radio League, PO Box 443, Aurora IL 60507.

NEW PRODUCTS

FIELD-STRENGTH PLUG-IN ELEMENT FROM BIRD ELECTRONIC CORPORATION

The latest addition to the assortment of plug-in elements for Bird Electronic Corporation directional wattmeters is an extremely sensitive relative field-strength element. Model 4030 expands the usefulness of Thruline™ wattmeters by helping optimize the radiated signal of any transmitter from 2 to 1000 MHz.

It is easy to increase the reach of business or personal transceivers and to extend the range of HTs by tuning, adjusting, and positioning antennas for maximum meter indication on the host wattmeter.

Model 4030 employs modern broadband circuitry instead of the highly reactive resonant networks of most field-strength meters. The element consists of a flexible receiving antenna, a single highpass network, and a variable-gain rf amplifier/detector. A battery-saving feature turns everything off when the element is removed from the wattmeter.

Typically full-scale deflection is obtained from a one-Watt CW source at 150 MHz through a quarter-wave antenna 8 feet distant. Dynamic range is at least 30 dB, and battery life is 100 hours or more.

For further information, contact *Bird Electronic Corporation, 30303 Aurora Road, Cleveland (Solon) OH 44139.* Reader Service number 477.

Model 4030 from Bird Electronic Corporation.

MCM ELECTRONICS 1984 CATALOG

MCM Electronics, Centerville, Ohio, a parts and accessories distributor to the electronics industry, has published their 1984 catalog.

The 120-page catalog contains more than 4,500 parts and accessories. Featured are over 500 new items, including an expanded line of computer parts, new styli, and video parts. Also included are a new line of magnetrons for microwave-oven repair, new test equipment such as the Tenma 20-MHz dual-trace oscilloscope, and a large selection of Japanese semiconductors.

For a free copy of the 1984 MCM Catalog, call toll free *(800)-543-4330* (in Ohio, call *(800)-762-4315*). For more information, contact *MCM Electronics, 858 E. Congress Park Dr., Centerville OH 45459; (513)-434-0031.* Reader Service number 480.

HD-8999 ULTRAPRO CW KEYBOARD

The HD-8999 UltraPro CW Keyboard, recently developed by Heath Company, is a third generation of code computers. A 64-character type-ahead buffer permits typing faster than the keyboard is sending. Ten variable-length buffers eliminate waste when storing text. Messages stored in the buffers can be compiled, corrected, or transmitted with no more than three keystrokes. A large, four-digit LED display indicates many functions: speed, spacing, weighting, serial number, remaining message-character space, input error, tune mode, sidetone on/off, keyclick, and individual buffer protection. An 8-segment bar graph indicates fullness of the type-ahead buffer. UltraPro parameters can be set from the keyboard, and battery backup of the CMOS memory retains buffer contents and last-used parameters should power fail or the keyboard be turned off. Three different four-level code-practice modes are built in, as are turn-on circuit diagnostics, a sidetone oscillator, and a speaker.

For more details on Heath's HD-8999 UltraPro CW Keyboard, send for the latest, free 104-page Heathkit Catalog. Write to *Heath Company, Dept. 150-355, Benton Harbor MI 49022.* In Canada, write to *Heath Company, 1020 Islington Avenue, Dept. 3100, Toronto, Ontario M8Z 5Z3.* Reader Service number 479.

TELEX/HY-GAIN ANNOUNCES HOT LINE

Minneapolis—Telex/Hy-Gain has installed a toll-free customer-service hot line for amateur-radio products. In the continental US, the number is (800)-328-5652. In Minnesota, the number to dial is (612)-887-5528. Calls will be accepted during normal business hours, Monday through Friday, 8:00 am to 5:00 pm, central time.

The company stated that the toll-free number is good only for calls concerning amateur-radio products. The purpose of the service is to assist amateurs with product selections and to help answer

The Heath HD-8999 UltraPro CW Keyboard.

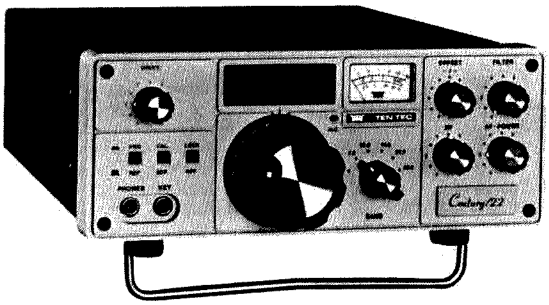
questions about applications or installations. The toll-free service is effective immediately.

For more information, contact *Telex Communications, Inc., 9600 Aldrich Ave. So., Minneapolis MN 55420; (612)-884-4051; telex, 29-7053.*

CENTURY/22 CW TRANSCEIVER

Ten-Tec has announced the Century/22, a 6-band CW transceiver. Premiered at Dayton, the new rig was scheduled for production in July. A worthy successor to the popular Century/21, the Century/22 fills the need for a reliable, low-power, no-frills yet effective HF CW transceiver.

For more information, contact *Ten-Tec, Inc., Highway 411 E., Sevierville TN 37862; (615)-453-7172.*



Ten-Tec's Century/22 CW transceiver.

DESIGN ELECTRONICS OHIO T/R SWITCH

Design Electronics Ohio has announced the introduction of the QSK 1500, an all-solid-state, American-made T/R switch which uses state-of-the-art high-power pin diodes for ultra-fast silent switching. The installation of the QSK 1500 between a QSK (full break-in) transceiver and any linear amplifier (including home-brew) allows full break-in QSK CW operation at the 1500-Watt power level. In addition, it also allows the operation of high-power AMTOR with any amplifier.

Since the QSK 1500 uses pin diodes instead of vacuum relays, its operation is totally silent. Installation requires no modifications to either your QSK transceiver or your amplifier. Because of its broadband design, the 1500 will operate from 1.8 MHz to 30 MHz without any additional switches or controls to adjust.

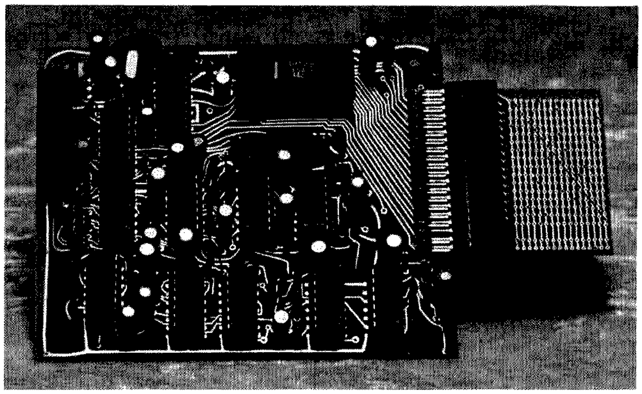
The external QSK T/R switch has virtually no insertion loss on receive and does not degrade the front-end performance of any transceiver. Guaranteed insertion loss is less than 0.6 dB and typical insertion loss is 0.25 dB.

The QSK 1500 includes at no extra cost a custom-designed power supply and control panel plus a receiver-line protection circuit which prevents damage to the front end of solid-state QSK transceivers due to the presence of high-power rf fields (such as multi-contest operations or nearby amateurs running high power).

Installation of the 1500 does not change the pattern or character of the transmitted waveform, nor does it produce any TVI or electronic garbage over the rest of the spectrum. It will not change the quality of the signal that your QSK transceiver and linear amplifier produce; it only switches your rf and does not alter it.

The QSK 1500 comes as a 2-unit set, color-coordinated to match most popular QSK transceivers. The two units furnished are the rf-switching unit which mounts out of sight behind your operating desk, and the power supply/control unit which is placed at your operating position. After installation, there is only one control associated with the 1500—the on/off switch.

For further information, contact *Design Electronics Ohio, 4925 South Hamilton Road, Groveport OH 43125, or call Ralph Rickett at (614)-866-4267.* Reader Service number 478.



The TTC300 touchtone remote-control board from Spectrum Communications Corp.

TTC300 TOUCHTONE™ REMOTE-CONTROL BOARD

The Spectrum Communications Corporation TTC300 is a new DTMF (touchtone) controller board which provides remote DTMF control of virtually any on/off function via a radio or any type of link with audio output (such as wire line or phone line). Typical applications include remote control of functions at a repeater site or any location with a radio line, and industrial controls at plants, pipelines, and construction sites, etc.

The controller includes the following features:

- new high-quality crystal-controlled decoder IC, with high immunity to falsing
- decodes all 16 digits
- 3 on/off functions per main card; expands to any number of functions with expansion cards
- field programmable via plug-in coded cards
- 3 latched on/off outputs, 4 pulsed outputs, or a combination thereof
- transistor switch outputs can directly trigger solid-state circuitry or relays, etc., for any type of control function
- can be interfaced to microprocessor controllers
- low-power-consumption CMOS technology; 5-V-dc input

For more information, contact *Spectrum Communications Corp., 1055 W. Germantown Pk., Norristown PA 19401-9616; (215)-631-1710; telex 846-211.* Reader Service number 481.

✓ See List of Advertisers on page 98

73 INTERNATIONAL

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laration of a Civil Emergency was imminent. At 0345 the CD warning siren system began sounding, but even this system was affected by flooding; only four of the seven sirens were operational. Added to that, only one of the three local radio stations remained on the air after the declaration of the emergency, the other two suffering water damage to studio transmitter cables.

The telephone call-out of AREC personnel to man CD HQ was thwarted because the flooding also had affected some of the telephone circuits. Only two operators were contacted by telephone. After the warning sirens had sounded, some AREC operators came up on the Invercargill 680 repeater and were directed to CD HQ for duties. Around 0415, several AREC operators had arrived at CD headquarters, and all reported having to take numerous detours to get to the headquarters building in the center of the city. Reports were being received through the 660 repeater of operators available but unable to cross the flood waters to get to the central city, so the communications center had to make the best use of the five operators available and hope that others would eventually somehow find a way to headquarters.

By around 0430, a small number of the CD HQ operations staff and emergency liaison officers had arrived and the operation of CD HQ was under way. A Civil Defense vehicle with a radio operator was dispatched to check the extent of the flooding, and information from this reconnaissance and the Emergency Service reports indicated a very serious flooding situation throughout the entire city area.

People evacuated so far were located and cared for in a welfare center opposite CD HQ, so no communications were required to that post. Regular situation reports were being received over the CD communications net on 149 MHz, and a steady flow of reports continued until about 1000 hours when it was reported that an evacuation was to take place in the suburban area of Grasmere. A radio link was set up with the welfare center at Collingwood School, where the evacuees from Grasmere would be taken.

While all this activity was continuing in Invercargill, the surrounding towns and areas in western Southland were experiencing severe flooding and residents were being evacuated. The Invercargill 680 repeater was used as a link between these areas and CD regional HQ, and the AREC communications vehicle was set up at CD HQ to provide ground-to-air communications for the two Air Force Iroquois helicopters being sent by the Air Force to participate in rescue operations with the two civilian helicopters already operating.

About 1400 hours, all hell broke loose as the flood banks on the Waihopai River broke and torrents of water engulfed the northern part of the city, the North Road industrial area, and the South Grasmere residential area. Within 30 minutes the water was six to eight feet deep, covering this large area of the city, and the Collingwood School welfare center was now cut off from the rest of the city.

Because of increased radio traffic, a spare portable VHF set was dispatched to the Collingwood center by 4WD vehicle, and a CD rescue squad was sent to assist in the Grasmere-Collingwood area. The 4WD vehicle and operator arrived at Collingwood almost an hour later, after detouring through Otatara, West Plains, and across country, after many extra miles, when in normal circumstances the journey would have only been about 15 minutes. Shortly after the arrival of the operator at Collingwood, the number of evacuees exceeded 300 and a decision was made to try to move these people to a welfare center established at the Hostel of the Boys High School. A convoy of Army trucks was to be used for this transport task, as the only suitable route was by North Road and this was covered by four to five feet of water.

A civilian radio operator and a VHF set were supplied to the Boys High School welfare center, as there was still a shortage of AREC operators at HQ and by now (1530 hours) the entire city was cut off by flood water from the rest of the country. Radio messages from the two welfare centers, from the rescue squads, and from a rescue jet boat kept the HQ operators extremely busy. Messages were being written on any piece of paper as the supply of message pads had run out and there was no time to go looking for more. About this time, the radio log became the communications center's record of many of the messages sent and received. All messages were unregistered because of the staff shortage, and as most messages required life-saving action, prompt handling was essential. For many of the messages, it was quicker for the operator to get the addressee of the message to the radio—then immediate action and reply followed, with only brief details being recorded in the log.

Around 1600 hours, the Iroquois helicopters arrived and became operational and joined the two commercial helicopters in rescues at Grasmere. Communication with these aircraft was on 119.1 MHz, and this operation fully occupied one HQ AREC operator.

At 1700 hours, floodwaters in the south of the city had dropped enough to allow some replacement AREC operators to report to HQ, and these operators were used to relieve some of the HQ operators who had been on duty for over 12 hours. The emergency operations continued into Friday night, it being necessary for an Iroquois rescue even at 0058 Saturday morning. The four aircraft returned to full air operations again at 0600 hours.

While the south city floodwaters were subsiding during Friday evening, those in the north and west were still rising. Evacuations continued in these areas throughout the night and into the early hours of Saturday morning. At 0600 hours, Saturday, 28 January, a volunteer Army-trained radio operator, now a civilian, arrived to operate the ground-to-air communications. He remained at this set until the next Tuesday, January 31, and did an excellent job. At 0700 hours, a request was received from the airport control tower to change frequency to 118.1 MHz, and as well as ground-to-air communications, CD HQ kept in touch with the airport as the water level rose there until eventually the tower operator had to be evacuated, the airport now being completely flooded.

Communications continued along these lines for the next few days, still with 24-hour operation. Operators were now more plentiful, with the return of AREC members from holiday, and a more civilized shift system could be introduced. Messages had now changed from rescue- to welfare-type communications, but the volume had reduced only slightly.

Tuesday, January 31, at 0800 hours, after 100 hours of continuous operation, the emergency was over and it seemed as though we could pack up, when the controller requested 10 hand-helds and operators to accompany the City Health, Electrical, and Building Inspection teams who were examining the evacuated homes to declare them fit for habitation again. These teams had a vital need for communications to coordinate their activities and to provide the information Center with details so the residents concerned could be kept informed. Most of the evacuated homes had been under six to eight feet of water and, to complicate matters, nearly all had been fouled by sewage due to the breakdown of the sewage system. Most could not be reoccupied until some remedial action was taken.

As many of the Invercargill operators were now back at their own work, it was difficult to see how this request could be filled, so an urgent call to Dunedin AREC for 10 operators with hand-helds and a portable repeater was made. The Dunedin team took over on Wednesday and continued until Sunday, February 4. A massive clean-up was scheduled in the Grassmere area on that Saturday, when 25 trucks, each with an operator with a handheld controlled by a coordinating center, were arranged. As well as the operators with the trucks, a further 11 operators were assisting with the inspection and welfare operations between the hours of 0800 and 1800, communications being on the two CD VHF frequencies and two 2m frequencies.

Operations were now scaling down until eventually, on Sunday, February 12, all AREC and CD equipment was dismantled, and any communications then necessary continued by telephone.

The size of the flooding disaster was enormous. The amount of damages was several million dollars, and at the peak of the emergency over 3000 people from about 1000 homes were evacuated and housed in welfare centers or with friends and/or relatives. It was to be some time before all those evacuated were able to return to their homes and return to a normal life again. Invercargill is a city of about 56,000 people, and from the statistics, about 5% of the population had to be evacuated from houses inundated by more than four feet of water during the height of the flooding. Other areas in the Southland district were also affected, and also most of the city of Invercargill.

The summary of the radio communications system indicated that it would be advantageous for all Civil Defense headquarters communications centers to have equipment available to operate on the amateur frequencies, so as to allow the large pool of hand-held amateur transceivers and portable equipment to be available for CD communications, since no local CD organization will ever have sufficient equipment of their own to cope with a similar extensive situation. The communications system must be portable and flexible to allow sets to be installed where you least expect it, and a total commitment to type-approved equipment on 148 to 150 MHz will not allow this to happen.

Once again, the Amateur Service has been able to put its expertise to good use in an emergency situation, and although Civil Defense has its own special frequencies, most of the operators in the CD communications system are ZL amateurs. But in this instance, also, because of the extensive nature of the disaster, additional radio assistance was made available through the Amateur Radio Emergency Corps, with additional operators, portable equipment, and the amateur-radio repeater systems within the area of the disaster.

ZL9—AUCKLAND AND CAMPBELL ISLANDS

Last month I told you a bit about the Kermadecs, ZL8. This month I shall try to provide you with a picture of the Campbell Islands.

The Auckland Islands are about 500 km south of the southernmost part of ZL and are uninhabited, except maybe for lots of penguins and seals. So there is not very much chance of a contact with the Auckland Islands unless some amateur visits the islands for some obscure reason. However, the Campbell Islands are a different kettle of fish. Campbell Island, situated 52° 33' S, 169° 8' E in the South Pacific Ocean, covers an area of 114 square km and is about 48 km in circumference. The island is semicircular, has good harbors, and is now a manned weather station, playing an important part in the forecasting of New Zealand weather.

Prior to this, it was used as a coastwatching station during World War II, and the history books tell us Campbell Island's first settlers arrived in the early 1800s. Activities on the island included sealing and whaling, and in later years a sheep station was established.

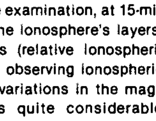
As a weather station, there normally are about 10 people there at any one time, and the normal stay is 12 months (from November to November). A typical island crew is an officer in charge, a cook, a mechanic, four Met personnel, and three technicians.

Besides three hourly weather observations and two radiosonde balloon flights each day, Department of Scientific and Industrial Research observations of a more technical nature are made. These consist of a close examination, at 15-minute intervals, of the ionosphere's layers, riometer recordings (relative ionospheric opacity receivers) observing ionospheric noise at 30 MHz, variations in the magnetic field (which is quite considerable at this latitude), and VLF recordings using a delta loop made for Otago University.

Auroral displays are quite common at Campbell, and a 16mm all-sky camera operates every night taking one exposure every five minutes to record the event, though on many nights an abundance of clouds makes it difficult even for an amateur photographer. Continuous seismological recordings also are made at Campbell.

The technicians process the magnetic and seismo records once each week, and the results are then sent by radiotelephone to Christchurch.

From time to time, amateur-radio operators are amongst the technicians who are down at Campbell Island for their year's term, the last one being John Holtum ZL3HI/A, a Grade II operator, who was active on 80-meter phone and CW as well as 2 meters. John was at Campbell during 1982/83.



POLAND

Jerzy Szymczak
78-200 Bialogard
Buczka 2/3
Poland

The SP DX Club in Poland celebrates 25

years of activity. After one year of stagnation, the SP DX Contest took place in 1983. The best foreign radio stations:

MOMB Category	
UK6LAZ	50,022 points
UK4FAV	49,938
UK5IBB	39,975
SOMB Category	
UA1ZDW	28,290
UA9DHP	25,194
UD6CN	25,080
Monoband Category	
UB5BBT	3.5 MHz
SM0NBG	7 MHz
UF6FF	14 MHz
UA9AHS	21 MHz
UL7BBW	28 MHz

The best Polish stations:

MOMB Category	
SP3KEY	189,334 points
SP2PDJ	180,960
SP7KTE	105,360
SOMB Category	
SP8ECV	111,824
SP9EVP	77,805
SP9ADV	65,591
Polish Monoband Category	
SP1ADM	3.5 MHz
SP9EWN	7 MHz
SP2AYC	14 MHz
SP9CDA	21 MHz
SP6FBK	28 MHz

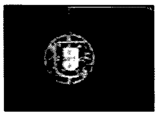
The International Commission of PRAA (Polish Radio Amateurs Association) has its hands full. The congress of the First Region of IARU took place in Sicily this year. Many documents and suggestions have been prepared for the Executive Committee of IARU, the Ministry of Communications, and Headquarters of PRAA. As delegates to the congress of IARU were appointed SP5LVV, SP5HS, SP5BFW, and SP6ARE. The chairman of the EMC team is to be SP9ZD. As a candidate for Executive Committee of the First Region of IARU, Wojciech Nietyksza SP5FM has been proposed. In connection with the World Year of Telecommunication, the State Radio Surveillance gave its consent to have 10 Polish radio stations under the WCY banner.

The following contests are included among "Intercontest KF 1984" in Poland this year:

- SP DX Contest (SSB)—April 7-8.
- WPX Contest (CW)—May 26-27.
- CQ MIR—May 8-9.
- All Asian Contest (SSB)—June 16-17.
- IARU Radiosport—July 14-15.
- WAE DX Contest (CW)—August 11-12.
- All Asian Contest (CW)—August 25-26.
- WAE DX Contest (SSB)—September 8-9.
- CQ WW DX Contest (SSB)—October 27-28.
- CQ WW DX Contest (CW)—November 24-25.

The President of PRAA, Prof. A. Zielinski, sent a telegram of condolence to the ARRL because of the death of the President of the ARRL, Vic Clark W4KFC, a well-known in Poland American sender.

Lately it was announced that District Verification Boards had brought 2,860 individual and 193 club licenses up to date by the end of November, 1983. This is not many in comparison with the about 12,000 Polish radio amateurs.



PORTUGAL

Luiz Miguel de Sousa CT4UE
PO Box 32
S. Joao do Estoril
2765 Portugal

We shouldn't have any doubts that *73* is a magazine read all over the world, according to the letters kindly sent to me in the past weeks by CT1AGC/Panama, CT1DN/CR9, DL2MCM, G4VUB, PT2ZAI (who came last March), PY4LF, N9DZO (who called me from REP Headquarters), W1BFA, W4DGA, KA1EWT, W1TIV, and others. For all of them, my sincere thanks.

IFACTA 84 PORTUGAL

Last March, on the 25th, for a period of one week, a very important meeting was held in the Estoril Sol Hotel (Estoril). Ernie Bracy W1BFA, who came for the conference, too, left us a report concerning that event, as follows.

Rede dos Emissores Portugueses (REP) was host amateur-radio station for the annual conference of the International Federation of Air Traffic Control Associations and took its place among others in welcoming the air-traffic-control people to Portugal. Other participants included the President of Portugal, the Minister of Social Equipment, the Mayor of Cascais, the General Tourist Office, and the public corporation, Aeroportos e Navagacao Aeria (ANA).

Each year W1BFA operates an amateur-radio station in conjunction with the conference. (Last year's operation was in Yugoslavia and the callsign was 4N0ATC-W1BFA/YU2).

Ernie arrived in Portugal on March 24th. It was a windy, showery day. However, amid high gusts of wind and downpours of rain, he and I installed a minibeam (HQ1) on a superstructure on the top of the Hotel Sol Estoril, the equivalent of 20 stories in the air. A top-floor room had been reserved, but at the last minute it became unavailable. On Sunday, the 25th, Ernie ran the cables down to the 12th floor and put the FT-902DM T/R loaned by REP on the air. It was just in time to make a few WPX Contest QSOs and check out the coverage.

Daily, during the conference, station CT1REP/W1BFA was utilized as the Net Control Station for the International Air-Traffic-Control Net which operates on 14.277 kHz 10:30-12:30 UTC. (Last year the net had 900 stations check in; it supports a regular membership of over 100 stations.) The net is made up of air-traffic controllers, pilots, aviation technicians of various categories, and aviation-interested people. Additional information can be obtained from W1BFA, net controller.

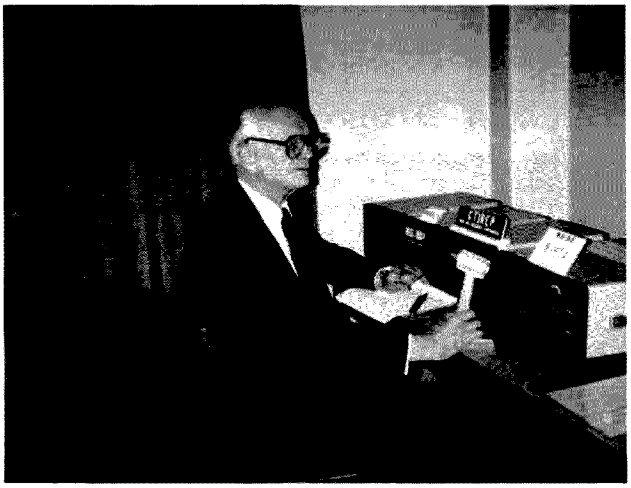
Contacts during the week were maintained with some 30 countries in spite of the poor propagation. The IFATCA Conference was attended by people from nearly 50 countries. In addition to W1BFA, EI4BK, a G operator, and TF3MXN were in attendance.

Ernie W1BFA expressed his warm, heartfelt appreciation to REP for the loan of the equipment and for giving permission for the operation in Portugal.

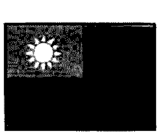
ELECTIONS IN REP

On the 31st of March, the annual General Assembly was held in Lisbon to approve the accounts and to elect a new board of directors for 1984/85. Due to the absence of candidate lists, the Assembly elected an administrative commission of 5 members who should prepare for new elections in a year's time. We are sure that the new members will continue the hard and exhaustive work that is involved in an association such as REP and all the important affairs, like reciprocal foreign licenses, info for new hams, QSL bureau, periodical information sheets, etc.

That's all from this sunny and warm country. *73* until next time.



W1BFA operating CT1REP from his Estoril hotel. (Photo by CT4UE)



TAIWAN

Tim Chen BV2A/BV2B
PO Box 30-547
Taipei, Taiwan
Republic of China

A group of European hams consisting of PA/OH/SM was scheduled to arrive in Taipei for 7 days of operating from April 16 through 23, 1984. The group was granted the special callsign BV0AA instead of BV0DX as previously reported.

Gerben PA0GAM, who initiated the DXpedition application, arrived in Taipei on April 16 with his IC-740, amplifier (GLA1000), and a tribander vertical. Gerben advised us that SM0GMG had not embarked on the airplane because of his father's illness. Poor Lars! He missed the trip and so did not come up in the BV0AA's logs; we are greatly distressed that this

OH2BH (left) and PA0GAM at BV0AA.

Left to right: L. C. Huang (CRA Deputy Secretary), Matti OH2BH, Gerben PA0GAM, Michio JA1MIN, and me (Tim BV2A/BV2B).

happened to him. Matti OH2BH arrived two days later, bringing along with him two transceivers (FT-757GX), amplifier (FL2001), and a Hy-Gain 2-element beam. Matti picked up Michio JA1MIN to replace SM0GMG in the group.

Under the bright moon, the group started promptly to erect the beam antenna tor the betterment of DX QSOs. The job was completed very quickly as the mast pipes and guy wires had been ready for use. Everyone showed enthusiasm and close cooperation to commemorate the special day—World Amateur Day—in addition to their DXpedition activity. Incidentally, OM Barry Goldwater K7UGA, visiting here, had been informed of the DXpedition so he could enjoy some relaxing along with his busy official duties.

Last year, I reported in detail the DXpedition of the Italian Blue Team, and following that many are still questioning me about the possibility of visitors operating in this country and how to get the permission. Yes, it was a problem with us, but now Chinese authorities in Taiwan have granted three permits to three different groups. Individual visitors can be permitted to work as "second operator" at BV2A/BV2B. It indicates that we are agreeing to the ham's activities.

What will be next? The Chinese authorities have gradually granted more privileges to group visitors; they are allowed to use 7 MHz besides the 10-, 15-, and 20-meter bands. 144 and 430 MHz will be allowed for the next DXpedition group, then scheduled to arrive in Taipei on June 8th. The PA/OH/JA operators of BV0AA had a nice score of approximately 12,100 QSOs covering 77 countries during the week of operation on the frequencies mentioned above. The outcome was considered good as propagation was FB.

As before, all visitors relaxed after their task was over and were entertained with sightseeing and a dinner party given by the China Radio Association (CRA), where they were met by many VIPs and old oldtimers.

Representing NCDXF, OH2BH presented to CRA a 2-element beam antenna to foster goodwill and to promote more ham activities in this country. We thank the NCDXF for its thoughtful plan! Also, we are happy to own an FT-757GX and FL2001 amplifier left behind by the expedition group at our request. Together with the beam antenna, we have pledged to establish a third BV station in this city. I am happily accepting a membership in NCDXF, by the recommendations of PA0GAM and OH2BH.

The last two expedition groups have shown us something different in radio-operating technique; all visitors are very skillful and well-disciplined. Also they brought in new amateur-radio equipment, synthesized, compact, and efficient, and often gave surprises to other users who also are quite interested in electronic technology.

A local newspaper reported on this friendliness, saying that it made the public more informed of the unique quality of world amateurs. China Radio had a 15-minute program introducing amateur radio through its nationwide net. One of the local TV stations approached us for an interview, but a little too late.

Another DXpedition, from Japan, is (as I write) arriving soon; the callsign will be BV0AB or BV0JA.

FLASH! The Chinese authorities have decided to grant 10-12 ham-station licenses in the near future! I will report the details later.

TRINIDAD AND TOBAGO

John L. Webster 9Y4JW
c/o Department of Soil Science
University of the West Indies
St. Augustine
Trinidad
West indies

THE 9Y-8P-LINK REPEATER PROJECT

This month we will look at an experimental project in which the TTARS and the Amateur Radio Society of Barbados (ARSB) have been jointly participating—the 9Y-8P-Link Repeater Project.

During the first half of 1983, this project, which had been in the planning stage for several years, finally became a reality, and the islands of Barbados and Trinidad were linked via the two-meter band.

This VHF repeater system is the first stage in a plan to link all of the Caribbean islands on 2m and is being used as the proving ground for the plan. Such a VHF link is desirable between the islands especially in times of emergency and disaster. Many of the Caribbean islands are vulnerable to the hurricanes that can, and often do, appear in this area during the period June to October. During these times, the islanders often have to rely on amateur radio as their only means of reliable communications.

The importance of having well-equipped and organized amateur-radio operators may easily be seen if you were to review the disaster that engulfed the island of Dominica when hurricane David wreaked havoc there for 8 hours on August 30, 1979. The following year it was St. Lucia's turn to suffer a similar fate with the passage of hurricane Allen. In both cases, amateur radio played leading roles in bringing relief to the affected communities, and they have been reported in the pages of *73*—the Dominica disaster in the May, 1980, issue by myself, under the title "Hurricane." The planned link repeater system is part of the ongoing effort to improve emergency communications throughout the region while at the same time enhancing our day-to-day contact with our neighbors. In the following paragraphs, I shall give a description of the system as it currently is (May, 1984) and comment on its success to date.

On the Barbados end of the link, the repeater site is located at Mount Misery; at 329 meters above sea level (ASL), it is the second highest point on the island. Mount Misery is actually the location for one of the communication centers of Barbados External Telecommunications, Ltd., (BETL)—formerly Cable & Wireless—the company that handles international communications for the island. BETL kindly allowed the ARSB the use of the site and space on one of their 62m towers.

The repeater is a Yaesu FTR-2410 with an input on 144.710 MHz and output on 145.310 MHz. The antennas used are a pair of Ringo Rangers with a vertical separation of 22 meters. The receive antenna is located at 54 meters above ground level (AGL) and the transmit antenna at 32 meters AGL. In addition to being the link repeater, it also serves as a secondary (or backup) repeater for the island, should the primary system on 146.310/.910 MHz fail.

The link to the Trinidad repeater is effected with an Icom IC-290. This transceiver drives an 80-Watt amplifier into a 15-element vertically-polarized yagi 20 meters AGL, pointed at Trinidad. The IC-290 transmits on 147.330 MHz and receives on 147.930 MHz—the frequencies used by the 9Y repeater. The IC-290 is interfaced to the 8P repeater via a homebrew interface designed and constructed by Ron Armstrong 8P6BN.

On the Trinidad end of the link, a Yaesu FTR-2410 repeater also is in use, driving a 100-Watt amplifier into a 4 × 4 element yagi array. The site is on Cumberland Hill in the northwestern part of the island. The location is 548 meters ASL and we have been provided space on a 62-meter tower through the kind courtesy of the local TV station. The antennas are located at the 46-meter level.

The system operates as follows. When a signal is received by the Barbados repeater on 144.710 MHz, it keys up that repeater and the signal is broadcast locally on 145.310 MHz. The interface interconnecting the BP repeater and the IC-290 also senses this signal and puts the IC-290 into the transmit mode, sending this signal across the Caribbean Sea to Trinidad on 147.330 MHz. The transmission is received by the 9Y repeater and simultaneously rebroadcast on 147.930 MHz for the reception of Trinidadian hams. When the signal being received by the 8P repeater on 144.710 MHz ceases, the interface unit returns the IC-290 to receive mode, and the 9Y repeater also returns to the standby mode.

When a signal from the 9Y end keys up the 9Y machine, the 147.930-MHz output signal is received by the IC-290 in Barbados. This triggers the interface unit which switches on the 8P machine, and the original transmission is then simultaneously rebroadcast in Barbados on 145.310 MHz.

The distance between the two repeater sites is about 338 km, and with the antennas at each end being less than 600 meters ASL, it can be seen that this is a very long path for reliable VHF communications. This fact has made itself evident over the past 10 months or so, and the reliability of communication via the system has often left much to be desired. There is much multi-path fading which, after the original novelty had worn off, has rendered operation through the system a frustrating experience. Many QSOs were had on the "ups" in the pathway, but only the patient operator waited through the "downs" to continue the QSO on the next "up"!

The system as originally set up has proven unsuitable in its original objective and an alternative plan has been pressed into operation. On March 10, 1984, the technical officers of the ARSB (8P6BN and 8P6FV) changed the link transceiver over to the J3 repeater on the island of Grenada. This repeater operates on 146.160/.760 MHz. Grenada, due to its geographical location, forms a most suitable stepping stone to break the lengthy path between Barbados and Trinidad.

As I write this, the new system has been in use for about six weeks and has met with very good success. It has allowed reliable communications between hams located on the islands of Barbados, Grenada, St. Vincent and the Grenadines, Trinidad, St. Lucia, and even some of the islands further north. In order to access this new system then, which is now a J3-8P link, stations must access either the J3 or the 8P repeater as the 9Y repeater is no longer a part of the system. On the Trinidad end, therefore, this has resulted in very restricted access to the system, mainly on account of the Northern Range, a mountain range with highest peaks of just over 1000 meters, that is along the entire northern coast of the island. As a result, only a few stations in ideal locations on Trinidad, running higher power (100 W and up) into multi-element directional antenna systems, are able to access the J3 repeater and get into the new link. Later this year it is hoped to install an interface unit similar to the one used in Barbados to link the J3 and 9Y repeaters. It is expected that when this is completed, all 9Y stations will have access to the link.

The ARSB has plans to improve the installation by the acquisition of a set of duplexers to relieve some desensing and intermodulation problems that have plagued their end from time to time. It is interesting to note that since the change has been made linking the J3 and 8P repeaters, the amplifier on the Barbados end has been cut off and the repeater run barefoot—just 10 W or approximately 500 W erp—and reliable two-way communications have been maintained.

PUBLIC SERVICE ASSISTANCE

On March 25, 1984, the TTARS provided the communications necessary for an International Go-Kart Race Meeting. The meeting was sponsored by the local Karting Club at the Go-Kart track at Chaguaramas on the northwestern peninsula of the island. This sport has recently been revived in Trinidad, and the organizers, seeking a reliable communication network, approached the TTARS for assistance. The TTARS members who volunteered their services were treated to a day of thrills but few spills, while at the same time assisting with the smooth running of the event. The 9Y participants included -4M, -HM, -WG, -VAN, and -GR.

HAM HELP

I need an SM5111A chip for my TR-7600.

Bill Fletcher AF9B
3302 Leopold Way, #111
Madison WI 53713

Wanted: Data information on a model TVC-500 Jerrold TV camera; also a serviceable used 8758 Vidicon.

Tad Drogoski
507 Coal Valley Rd.
Clairton PA 15025

I am looking for a copy of *Riding the Airwaves* by Eric Palmer, Jr.

Stephen J. Sierzega WA9MEK
3407 N. Normandy Ave.
Chicago IL 60634

I am looking for a copy of the Wayne Green book *How to Build a Microcomputer and Really Understand It* by Sam Creason. Will buy or put down deposit to look at it.

Harold May
428 Phillippa
Hinsdale IL 60521

I am looking for a service manual and a schematic for a VHF Engineering VHF amplifier model PA-1501H serial number 1102. I am willing to pay copying and postage costs.

Joe Barrett KA1PH
112 Sunny Cove Drive
Warwick RI 02866

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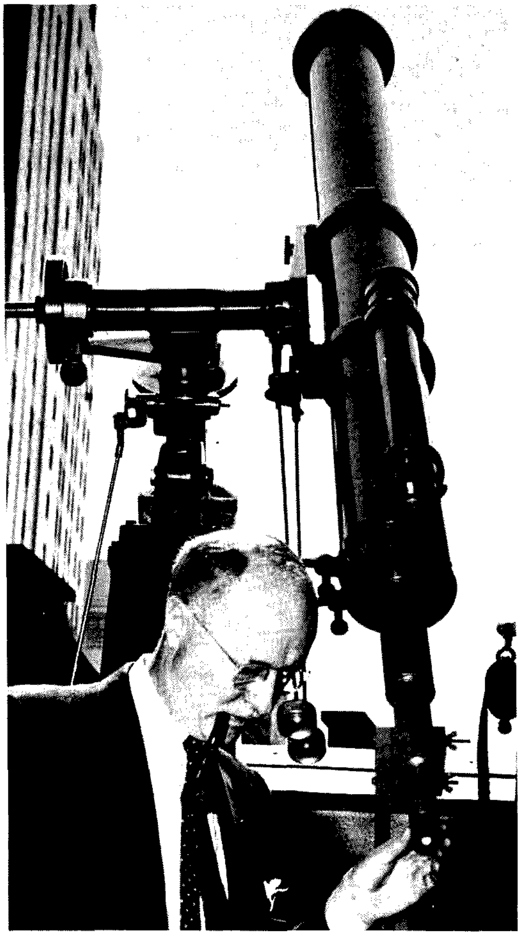

PROPAGATION

It is with deep sorrow that we note the passing of our good friend John H. Nelson on May 23, 1984.

For 15 years, John had the final word in 73, his propagation forecasts guiding the dreams of DXers throughout the world. He will be missed.

International Edition

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73 T.M.

Amateur Radio's Technical Journal

A CWC/I Publication

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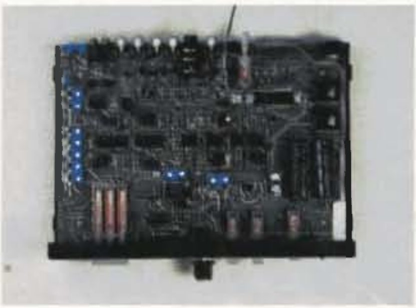

Computer Patch—84

73's SSB Contest Winners—1984

	40m	75m	160m
W/VE Single Operator	KE5CV	N4BAA	WA2SPL
Multi-Operator	K3TUP	K1WW	K9ZUH
DX Single Operator	KD7P/KH2	ZL1BQD	EA3CCN

Complete *73* contest results start on page 65.

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W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

STAR WARS

Zaaap, goes the laser beam! But if that was my ship doing the fighting, you can bet I'd spend the extra money for a radar system to aim the lasers and not send a Wookie to do a radar's job.

Lasers and fiber optics are the way things are going for communications. It's the only system which provides the bandwidth needed to get enough information through in a short time. Just look at the way we've had to screw up television, which is lousy enough, in order to send even a fuzzy slow-scan picture over amateur-radio channels!

It's information and bandwidth. If you want to send more information per unit time, it takes more bandwidth. A normal television picture takes about four MHz of bandwidth. With slow scan, we cut the lines to one-third and the pictures per minute from 3,600 to seven... and presto! We can get the information through a 2,500-Hz bandwidth window. It's fuzzy and there are eight seconds for the voices from the adjacent channels to tear up the picture, but those hardy SSTV folk keep at it, getting very nice pictures occasionally.

The information for TV pictures is analog, so it suffers from noise. If you record a TV program with your VTR and then re-record it on a second VTR, you'll see the degradation of the analog signal. Each copy is called a generation, and it doesn't take many to lose most of the information. It's the same with audio tape recorders. With digital communications, the hundredth generation is identical to the first—quite a benefit. There's no gradual signal loss to noise.

It was this aspect of digital communications which got me involved with RTTY 35 years ago. We had a ball in those days. Under the guidance of John Williams W2BFD, we had a wonderful two-meter network running, complete with a RTTY repeater atop the New York City Municipal Building. RTTY wasn't permitted on the other bands then. Oh, I experimented with it on 80m and made contacts as far as California (W6NRM), but I had to use on-off keying instead of frequency shift, so it wasn't nearly as effective.

On two meters we had autocall and auto-answer going fine. We could set our systems to print everything sent on the channel or to be selective and only look for messages addressed to our station. Paper was cheap, so I let my machine copy it all, wading through a floor full of copy when I'd get back from a weekend away.

Now, of course, you don't need paper unless you want a permanent copy for some reason. And instead of those big, noisy clunker Model 12 Teletype® machines, we use an inexpensive computer such as the Commodore 64. Even an old used $50 TI-99/4A will do it just fine. And you use a disk to save the weekend of information instead of a hundred yards of paper. You really should try RTTY now.

It's getting time to get the paper out of communications—even with magazines. I've been thinking about that. The old bandwidth problem again. If you are going to get *73* electronically, it is going to take either a whole lot of bandwidth or a lot of time. The halftone pictures we use in printing are darned near digital. Look at 'em with a good magnifying glass. By making a few more lines per inch, we could go digital. Or we can send four bits for each halftone dot and have 16 levels of dot. We

Continued on page 72

QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, 80 Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

Counter-Productive Basics: Part II

How hard can counting be? K4IPV tells us where the errors occur and how to fix them.

Joseph J. Carr K4IPV
5440 So. 8th Road
Arlington VA 22204

In the first installment of this series, we discussed the basics of digital frequency counters (DFC). We started with a discussion of the basic J-K flip-flop and then proceeded to develop its role in binary- and decade-counter circuits. In this installment, we will discuss applications of the DFC and some user problems.

DFC Input Circuits

The input stages of the DFC amplify and waveshape the input signal to make it compatible with the digital logic circuits of the counter. Most of the time, the input signal will not be a square wave or fast-risetime pulse as required by the digital circuits, but rather it will be an ac signal.

Fig. 1 shows a counter-input stage. The input amplifier builds up the signal and feeds it to the trigger circuit (often a Schmitt trigger). At frequencies below UHF, most counter-input amplifiers have an input impedance of 1 megohm shunted by some capacitance (often 20 pF). At VHF frequencies, however, this can lead to false counts or lowered sensitivity because of standing waves on the line. At those frequencies, the input cable acts like a transmission line. If this problem is experienced, it is possible to overcome the limitation by placing a 50- or 75-Ohm barrel attenuator in the line at the counter input. Provided that only 1 to 6 dB of attennuation is used, the loss of signal is balanced by achieving a matched input impedance.

The input signal very rarely will be the nice, clean square waves required for proper operation of the digital logic-circuit elements used to make a counter. The signals also may be too low in amplitude to operate the digital logic circuits or may be too noisy. Remember, a TTL flip-flop needs to see fast rise and fall times (i.e., good square waves) and amplitudes greater than 2.4 volts or they will not operate properly.

The input signal, then, is passed through two processing stages: an amplifier and a trigger. The amplifier is a wideband voltage amplifier with enough gain to build up the minimum allowable signal (usually 25 to 100 mV) to a level great enough to drive the trigger stage (i.e., 500–1000 mV).

The trigger stage is a

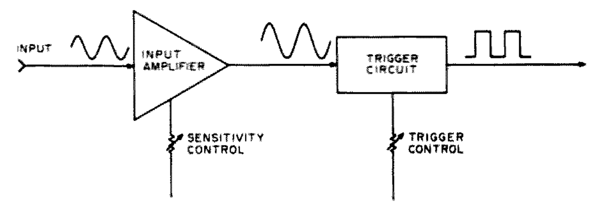

Fig. 1. Counter-input stage.

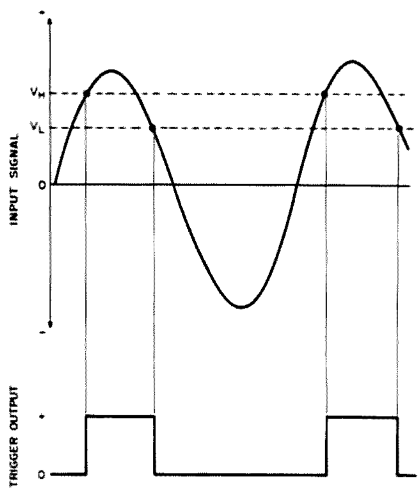

Fig. 2. Normal operation of a trigger circuit.

Schmitt-trigger circuit with a built-in hysteresis. This type of circuit is used to clean up irregularly shaped signals by making them into square waves. Fig. 2 shows the normal operation of a trigger circuit. The output snaps high when the input signal crosses the lower hysteresis limit and remains high until the signal crosses the upper limit in a negative-going direction. The hysteresis window is the quantity $(V_u - V_L)$. Note that the trigger output possesses the shape and amplitude required by the digital circuits that it drives.

It is a fundamental rule that input signals must cross *both* hysteresis limits or no count will be entered by the DCA. In Fig. 3, (a) shows the required situation: the input sine wave crosses both limits, but in (b) the sine wave crosses only one of the window limits, so no count is registered on the DCA.

Some counters have a *trigger-level* control that allows the user to adjust the position of the window over a wide range. Other models use a three-position switch labeled +, preset, and −. The switch allows the window to be placed in any of three locations (see Fig. 4). A continuously-variable trigger-level control allows positioning of the window *anywhere* within the range. Note that neither the continuously-variable nor the three-position-switch type of controls varies the *width* of the window $(V_u - V_L)$, but only the position. However, some counters are equipped with a trigger-amplitude control which *does* allow the operator to vary the width of the hysteresis window.

There are several factors that tend to reduce the accuracy of an electronic counter, and these can be grouped as *inherent errors* or *signal-related errors*. The inherent errors are a function of the quality, age, and history of the individual counter. Little can be done about these unless their source is a serious need for recalibration of the timebase. Signal-related errors, on the other hand, often are correctable by proper manipulation of sensitivity, trigger-level, and trigger-amplitude controls.

Inherent Errors

There are two sources of inherent error in all frequency and period counters: timebase error and a ±1 count ambiguity.

The timebase error is expressed in terms of a percentage or in parts per million. The error from timebase inaccuracies is directly reflected in all measurements of frequency or period. For example, suppose a 1-Hz timebase is off by 30 Hz (e.g., it is actually 1,000,030 Hz instead of 1,000,000 Hz). This is an error of 30 parts per million (30 ppm), which is [(1,000,030 − 1,000,000)/1,000,000] × 100, or 0.003%.

The measurement error due to timebase inaccuracy is constant regardless of the frequency being measured. That is to say, there will be a 0.003% error at 1 kHz and the same 0.003% error at the maximum frequency that the device will measure. For example, a 27-MHz signal would be measured with an error of (27 MHz × 30 Hz)/MHz = 810 Hz. This means that a counter reading 27,000,000 indicated that the actual frequency is 27 MHz ±810 Hz. In other words, the actual frequency lies between 26,999,190 Hz and 27,000,810 Hz.

If the timebase frequency is low, then the counter reading will be high.

Total timebase inaccuracy is the sum of several individual errors: *initial error, short-term stability, long-term stability, temperature change,* and *line-voltage change*.

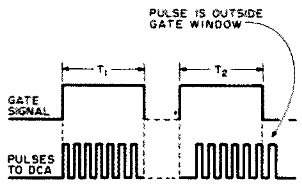

Fig 5. Lack of synch between input signal and timebase.

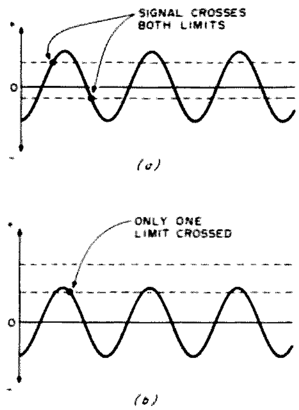

Fig. 3. The sine wave crosses both hysteresis limits in (a) but not in (b).

The *initial error* is the calibration error at the time the timebase is intially adjusted at the factory, or at recalibration in a metrology laboratory. Different methods are used to measure the timebase frequency, but in most cases the timebase-oscillator frequency is compared with standard-frequency broadcasts of the National Bureau of Standards radio stations WWV, WWVB, or WWVH. Alternatively, it might be compared with the output of a cesium- or rubidium-beam atomic clock.

The *short-term stability* is the timebase-oscillator frequency drift per day. *Long-term stability* is the frequency drift per month, and is often designated the *aging rate*.

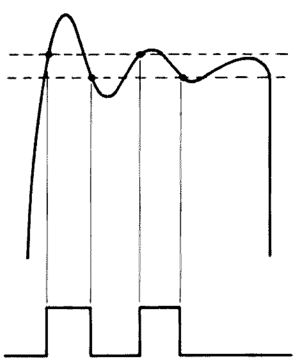

Fig. 6(a). Spurious counts created by extra crossings.

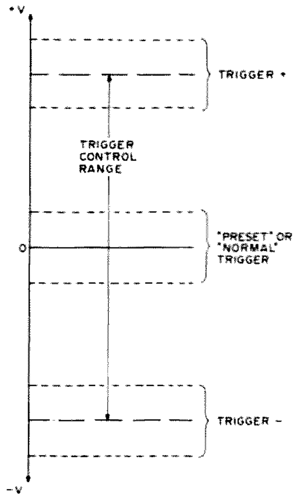

Fig 4. Three-position trigger-level control.

The *temperature-* and *line-voltage-stability* specifications refer to the frequency change over the 0–50° C temperature range, and ±10 percent line-voltage change, respectively.

There are four different classes of counter timebase: ac *line, room-temperature crystal oscillator, temperature-compensated crystal oscillator* (TCXO), and *oven-controlled crystal oscillator*.

The use of the 60-Hertz-ac line as a counter timebase is limited to the very cheapest models and a few low-grade older units. Even low-cost units today have a crystal

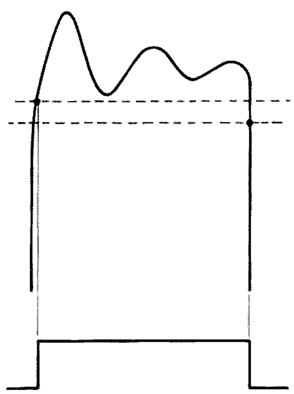

Fig. 6(b). Trigger-level control avoids spurious counts.

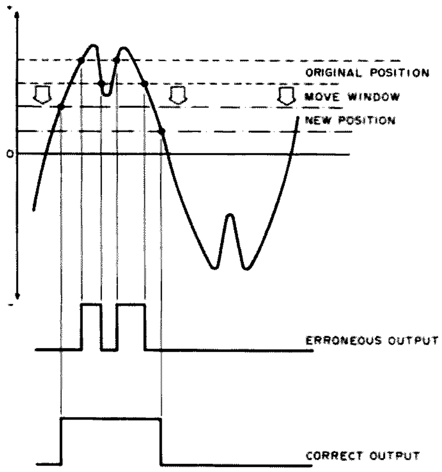

Fig. 7. Harmonic distortion of sine-wave-input waveforms.

	XTAL	TCXO	OVEN
Long term aging (per mo.)—	5×10^{-7}	2×10^{-7}	5×10^{-10}*
Short term aging (per day)—	—	—	10^{-10}
± 10% line voltage—	10^{-7}	10^{-8}	10^{-9}
Temp. 0-50°C (ambient)—	10^{-8}	10^{-7}	10^{-9}

*After 24-hour warmup.

Table 1. Typical stability specifications.

oscillator for the timebase, and even though the crystal is operated at room temperature, it provides better accuracy than the 60-Hz power mains. Note that power companies typically will quote very high accuracy figures for their power plant's operating frequency, but these are frequency averages over a very long time. The short-term accuracy, which is what concerns counter users, is terrible.

The TCXO is an encapsulated oscillator that is specifically compensated against temperature changes. The TCXO provides at least an order of magnitude better stability than room-temperature oscillators. The TCXO is less expensive now than in the past, so even moderately-priced counters now offer TCXO stability.

The oven-controlled crystal oscillator places the crystal (and in some cases the rest of the oscillator circuitry) inside an oven, or thermal chamber. Thermostat ovens are considered an order of magnitude better than TCXO designs, while the proportional-control type of oven is from one to two orders of magnitude better than TCXO.

Table 1 lists typical stability specifications for several models of counters by several different manufacturers. Note that the short-term stability is given only for the oven type of timebase. The TCXO and crystal oscillator must be operated for a full 24 hours before the stability reaches the specified level. At operating times less than 24 hours, the stability is poorer. Some models use a separate regulated power supply for the TCXO that is not turned off by the main power switch. Rechargeable batteries are used in portable models for the same purpose, so the TCXO is not turned off while the counter is being transported between job sites.

The ± count ambiguity is caused by the lack of synchronization between the input signal and timebase. This is illustrated in Fig. 5: During period T_1 seven pulses are gated into the DCA while during T_2 only six pulses reach the DCA. On some subsequent count, it may be that eight pulses are gated into the DCA. One fundamental rule for all digital-counter instruments is that there is an error of ± count of the least significant digit. In other words, a counter that reads, say, 10,000 Hz is measuring a frequency that lies between 9999 Hz and 10,001 Hz, i.e., 10 kHz ±1 Hz.

The ± count ambiguity produces an error that is inversely proportional to the frequency being measured and the gate time:

$$\text{Error (\%)} = \pm 100/fT$$

where f = the frequency being measured, in Hertz, and T = the time the gate is open, in seconds.

For example, let's find the percentage error due to ±1 count ambiguity at (a) 2 MHz, and (b) 27 MHz, for a gate time of 1 second.

Solution:

(a)

Error = $\pm 100/fT$

Error = $\pm 100/(2 \times 10^6 \text{ Hz})$ (1 sec)

Error = ± 0.00005 percent

(b)

Error = $\pm 100/fT$

Error = $=100/(2.7 \times 10^7 \text{ Hz})$ (1 sec)

Error = ± 0.000004 percent

The error is ±1 count regardless of the frequency being measured, so the *percentage* of error decreases for higher frequencies: Compare (a) and (b) above.

Signal-Related Errors

Poor signal quality can introduce errors that add to or subtract from the true count. Most of these errors

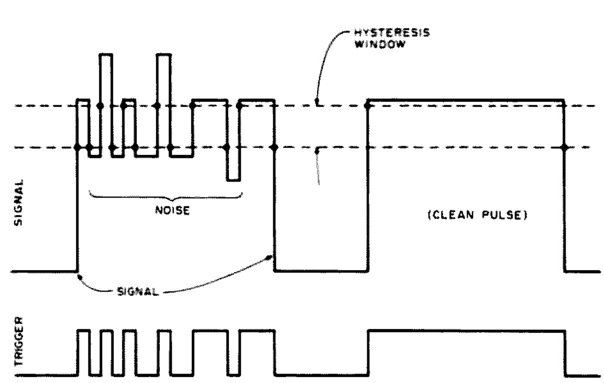

Fig 8. Impulse noises cross the hysteresis window.

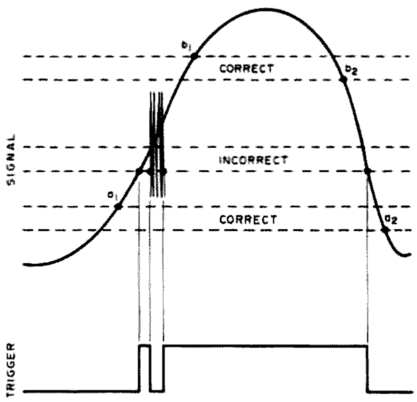

Fig 9. Correct and incorrect window positioning.

result from hysteresis-crossing or noise on the signal.

Trigger errors occur because the input signal crosses the hysteresis window limits too many or too few times. We saw in Fig. 3(b) that a signal will fail to increment the DCA if it does not cross *both* limits of the hysteresis window, causing too low a count.

Fig. 6(a) shows how severe ringing on a signal can create extra, spurious counts of the DCA if the trigger-level control is adjusted so that the ringing portions of the signal cross the limits, creating additional "input" pulses, a two-count error. The cure is to adjust the trigger-level control so that the ringing portions of the waveform fall outside the window limits—see Fig. 6(b).

The same problem exists on sine-wave-input waveforms (Fig. 7) that have a large amount of *harmonic distortion*. The cure is the same, however. Readjust the trigger-level control so that it is operating over a lower portion of the waveform.

Similarly, impulse noise riding on the signal can have an amplitude sufficient to cross both limits of the hysteresis window. An example of this phenomenon is shown in Fig. 8, in which a pulse in a symmetrical wave train is carrying impulse-noise artifacts. In the case shown, the noise bursts cross the window limits and thereby force the trigger output to create extra pulses instead of just one.

Once again, the correction requires readjustment of the trigger-level control to a point further down the waveform. In the case of a non-square wave, the noise may appear on the leading or trailing edges and still cause the problem. Fig. 9 shows the proper and improper positions for the hysteresis window on such a waveform.

Note that filtering of the noise is not usually feasible because of the bandwidth requirements of the input amplifier.

Fig. 10 shows a type of noise error that is particularly troublesome on period measurements. In this example, noise rides on a signal that has a shallow slope, and so creates a band of uncertainty around the signal. The trigger circuit should produce a high output when the signal crosses the upper limit and drop low again when the signal crosses the lower limit, but noise impulses adding to or subtracting from the signal amplitude could provide premature or delayed trigger transitions. The correct duration of the trigger output pulse in Fig. 10 is ($t_5 - t_2$), but under worst-case conditions the actual duration may be as much as ($t_6 - t_1$), and that amount represents a considerable error.

The solution for this problem is to cause the signal to slew through the hysteresis band as *rapidly* as possible. Two methods can be used to implement this solution. One is to narrow the window by adjusting the trigger-amplitude control, and the other is to increase the waveform's slope by preamplification.

On some types of signal waveform it is sufficient to adjust the trigger-level control so that the counter triggers on the *steepest* portion of the waveform. On sine waves, for example, this point occurs at zero crossings, but on other waveforms it may occur elsewhere on the signal.

One final type of signal-related problem involves the case where successive cycles have varying amplitudes. You can position the trigger so that it satisfies some of the cycles—see Figs. 11(a) and 11(b)—but others fall outside of the hysteresis window. Again, the solution may be resetting the trigger control.

How Much Sensitivity?

It is possible that a system can have too much sensitivity. While that statement may seem heretical, there comes a point where the sensitivity is too great because it permits noise or distortion artifacts to cross the window limits. In some cases, therefore, our "fix" for certain problems is to reduce the sensitivity or insert an attenuator into the line. ■

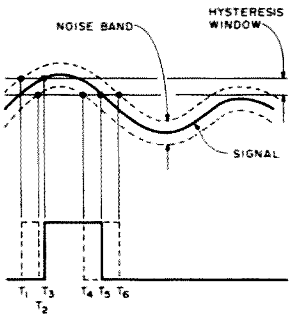

Fig. 10. Noise band along a shallow-slope waveform.

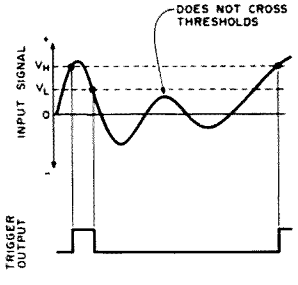

Fig. 11(a). Successive cycles with varying amplitudes.

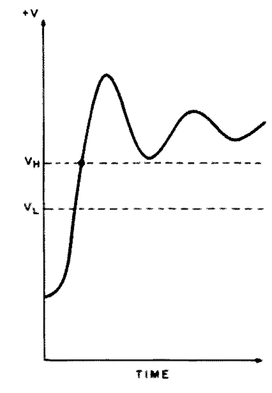

Fig. 11(b). Other cycles with varying amplitudes.

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Elementary, My Dear: Watts 'n' Swr

Stop guessing. Build this no-nonsense VHF/UHF wattmeter and save your hard-earned cash.

Here's a project everybody can use—a cheap, reliable wattmeter that can be used anywhere from 50 to 500 MHz. It uses an etched-line circuit for coupling and has two power ranges. Additionally, it can be calibrated to measure swr as well!

The idea for this project grew out of discussions the Split Rock ARA had back in 1980 concerning a possible club project. Among the many ideas kicked around was one for such a wattmeter, although at the time an unrealistic figure of $15.00 for the total cost was anticipated. As expected, the project never got off the ground.

I stuck with the concept and over the years tinkered with various designs. Somewhere in the past I had stumbled upon a circuit that used an etched transmission line and coupler, so a trip to the technical archives in the attic revealed what I needed. The big problem was that the etched line was nowhere near 50 Ohms! This wouldn't do at all. After all, what good is a 500-Ohm wattmeter?

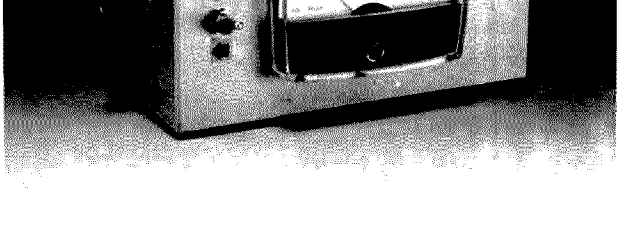
Additional research revealed that the dimensions of a 50-Ohm stripline etched on G-10 epoxy board were close to 1/10 inch in width, with any length usable. After confirming this with Steve Katz WB2WIK, I began carefully etching test boards in the darkroom using precision rulers and masking material cut with an X-acto® knife.

After about four prototypes, a board was produced which, when connected between two type BNC connectors (using the unetched side of the board as a ground plane), exhibited no reflected power on a Bird Model 43 wattmeter connected in series and terminated at 50 Ohms. Voila! I had done it. Now to the nuts and bolts of the circuit!

I should clarify any additional comments by saying that this unit is really a bi-directional coupler. As such, it can be used to measure swr or power—whichever you prefer. It samples a small amount of rf on the transmission line through a coupling line which is terminated in the middle. At either end, type 1N60 diodes are used to rectify this small sampled voltage. Add a few switches, pots, and a meter and that's it! Period.

As I just mentioned, rf energy traveling on the 50-Ohm section from input to output is sampled by the −30-dB coupler—sort of like winding a link coupling at HF frequencies. D1 and D2 can be almost any kind of point-contact diode, but the best choice would be a 1N60 due to the better performance characteristics at VHF/UHF.

The sampled, rectified dc voltage is then routed to R2 or R3 via SPDT switch S1. These two potentiometers set power ranges or can be used to set frequency ranges. Note that as with most wattmeters that use coupling lines, the degree of coupling



Front view of wattmeter.

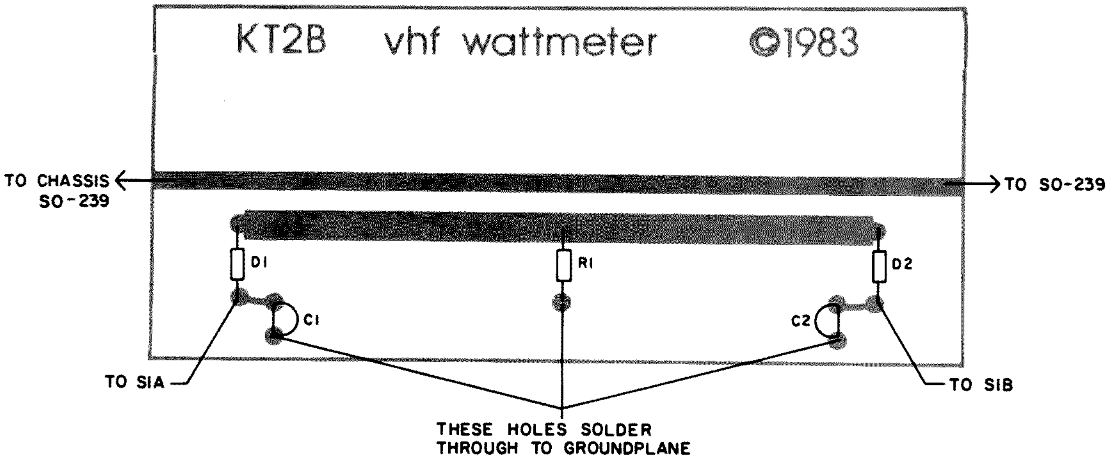


Fig. 1. PC-board overlay for parts.

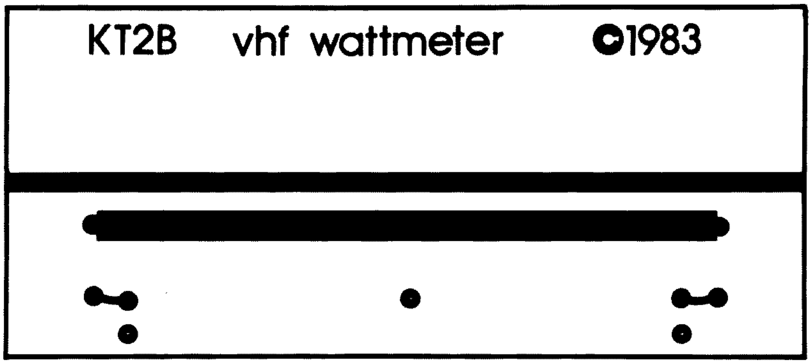


Fig. 2. Master art for PC board.

rises with the frequency chosen and decreases with a lower frequency, so that different readings will be evident on different bands for the same power level measured.

Also note that while the actual power measurement and its relation to the meter scale is a function of a logarithm, the relation between decades of measurement is a linear function. This allows the use of one meter scale on any band. Power levels up to 500 Watts can be measured accurately with this unit—typically within 10% of a Bird 43—but I haven't tried anything higher. Teflon™ board would be a better choice for higher power levels.

R1 on the sampling line functions as a termination, and you may have to tinker with it a bit to determine coupling characteristics. I found a value of 27–33 Ohms to be fine. C1 and C2 function as rf bypass capacitors. The best way to mount the PC board is to suspend it between two connectors—either type SO-239 or BNC female. Use finger stock or braid to make a good connection from the ground lug to the backside of the PC board.

I would suggest installing the meter in the case *first* before doing anything else. A recommended unit would be the Radio Shack #270-1751, 50-μA movement. It's inexpensive and has a big scale that is easy to modify. Next, mount the two switches, S1 and S2, on either side of the meter face. Prepare the PC board with all components as shown in Fig. 1, along with appropriate lengths of wire to connect to each switch. Install the side connectors of your choice along with about 1" of braid or finger stock for the ground connection. Finally, install the completed PC board by suspending it between the center pins on the connectors and then soldering the center pins to the 50-Ohm etched line. Solder the braid to the back of the double-sided board.

Calibration can be achieved with use of a known, accurate bridge or wattmeter, such as a Bird Model 43 or similar unit. Set the unit up to the ranges you desire by adjusting the ten-turn pots, R2 and R3. For example, you may wish to measure the output of two

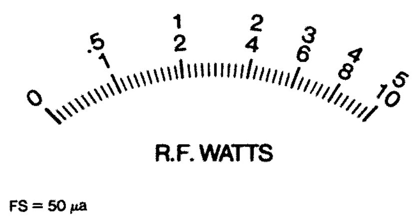


Fig. 3. Meter scale for Radio Shack 50-μA meter.

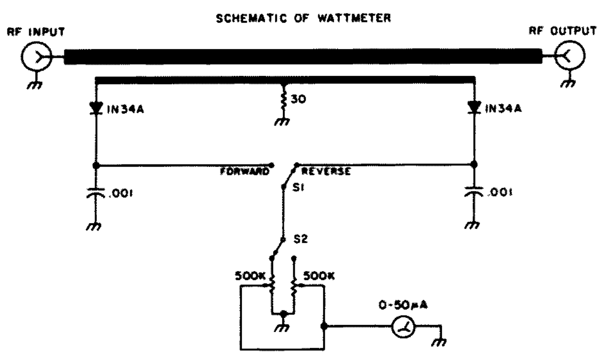


Fig. 4. Schematic.

Parts List

D1, D2	1N60-type diode or similar	Radio Shack	10 @ .99
R1	33-Ohm, 1/4-Watt resistor	Radio Shack	5 @ .39
R2, R3	15-turn, 3/4-Watt, 500k pot	Jameco #43P	$1.19
S1, S2	SPDT Minlswitch	Jameco #JMT121	$1.49
C1, C2	.001 disc, 50 volts	Radio Shack	2 @ .39
J1, J2	SO-239 connectors	Nemal Elect.	$ .79
M1	50-μA movement	Radio Shack	$8.95
Case	LMB TF-780 case	(distributor)	$3.80
			$21.46

mobile rigs; one with 25 Watts at 146 MHz and one with 10 Watts at 440 MHz. Or, if you wish, you can add additional trimpots for additional ranges.

I have included in Fig. 3 a template for a wattmeter scale that can be used instead of the 50-μA scale on the meter. Remove the meter face carefully, using a screwdriver to pry it off. Next, using extreme care not to bend the meter movement, work a small knife or screwdriver under the metal scale on the unit. Pry gently around the corners until it pops free, then slide it out. Use this metal scale as a template to cut the supplied scale to size. Reinstalling the new scale is easy since Radio Shack uses double-sided tape on the face to hold the factory-supplied scales. Snap the cover back on and you're in business.

As was stated before, accuracy has been measured to within 10% or better of a Bird 43 on the desired frequency. If you want, you can remove the meter and remote it, leaving the coupling unit in its own box. This could be handy for mobile installations! If there is interest, I can supply etched, drilled, and plated PC boards for $10.00 each. ■

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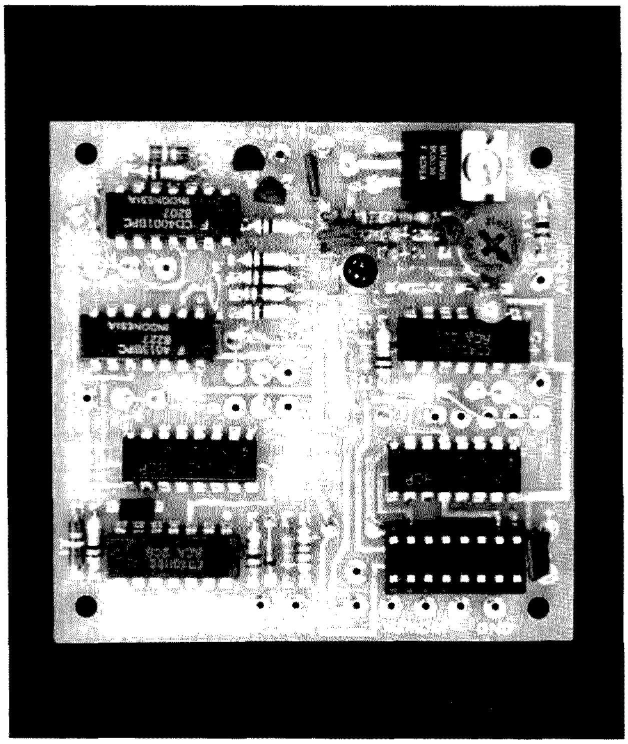
Perfect Timing

Proud of your repeater? Construct this multi-talented identifier and tell the world your who, what, and where.

Does the world really need a new repeater-identifier circuit or, for that matter, a new timer circuit? Why a new one when so many good designs abound?

Well, it was a combination of circumstances and specific needs which don't seem to be satisfied with the existing designs.

Bob's 2-meter repeater, VE2BG, shares a site with a commercial machine, one of several run by the operator. Said gentleman was advised by the DOC (Canada's version of the FCC) that all his transmitters (20 plus) must henceforth incorporate identifiers. Knowing that the commercial models would cost him a minimum of $500 each, he appealed to Bob for an amateur (read "low-cost") solution to his problem.



Identifier-timer board.

At about this point in time, VE2DWG developed a need for an identifier-timer for a proposed 10-GHz beacon. This would, every few minutes, send the beacon callsign plus a message giving the location and a QSL address for reception reports. This message would require about 200 diodes to program a conventional scanning identifier, requiring enough board acreage to grow corn as a sideline. This, plus the thought of installing a smaller number of diodes in 20 or more boards, was enough to convince us that programmable read-only memory (PROM) was the answer to both requirements.

The complication of building a PROM programmer seemed justified by the benefits to be gained. VE2DWG rashly volunteered to undertake this part of the project while VE2AO did the identifier-timer design. Enough said about this aspect of the project, except to note that as a consequence of this we are now able and willing to burn PROMs for those who like the design but don't want to go to the bother of haywiring together their own programmer.

The finished identifier-timer (the term seems to cry for shortening to something like *Identi-Timer*) uses six CMOS chips, a 256×4 (1K) bipolar PROM, a monolithic voltage regulator, and four transistors on a board three inches square to generate CW messages up to 256 bits in length. The addition of one more chip can increase this to 512 bits. Strapping options allow a choice of various timing options or

use as an identifier only. If your junk box is as bare as ours (at least when it comes to the particular parts that are necessary) and you end up having to buy all the components, the total cost should not exceed 25 dollars.

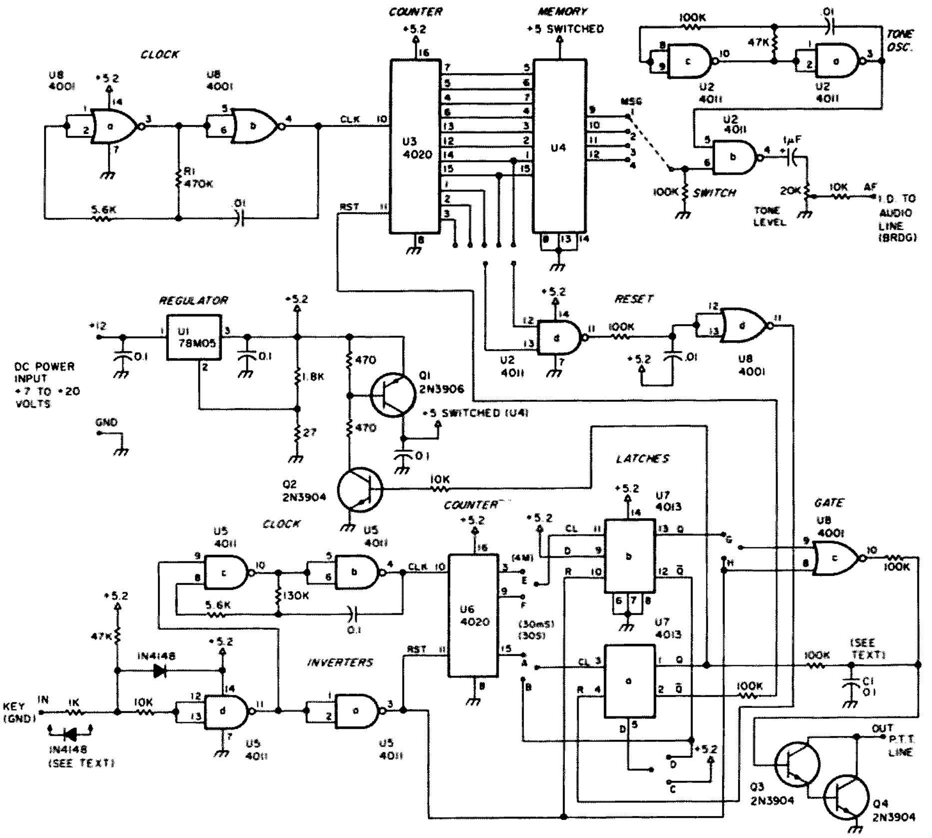


Fig. 1. Identifier-timer schematic diagram.

Construction

Parts placement is shown in Fig. 4. All resistors are ¼ Watt and are mounted flat to the board except for the two 470-Ohm resistors on the base of Q1; these are mounted on end, transistor-radio style. The 20k tone-level potentiometer is a Helitrim Model 91; anything of the same approximate size and lead placement will work. The lead on the voltage regulator should be bent at right angles before mounting, allowing you to secure it with a #4 screw and nut through a hole in the board for this purpose.

All ICs except the PROM were soldered in place on the 20 or so boards manufactured; no failure occurred which would have made the messy job of removal necessary. It hardly seems right to have to use IC sockets costing more than the chips that go in them, but this does necessitate buying good quality chips with minimal failure rates; the choice is up to the builder. A 16-pin DIP socket was provided for the PROM since callsigns do change.

Circuit Description

The unit is divided into two functional blocks: the identifier and the timer circuit. The identifier will be described first, since it is the less complicated of the two. All integrated circuits (except the PROM itself and the on-board voltage regulator) are CD4XXXB series CMOS.

The Identifier Circuit

The basic idea of the identifier is centered around a 256 × 4-bit programmable read-only memory containing the previously-entered bit sequence, in 1s and 0s, that represents the message to be sent in Morse. The address lines of the PROM are scanned in sequence by a binary counter at the desired rate, outputting the stored bits which are used to key an audio oscillator which is fed to the repeater audio line.

The counter is driven by an astable multivibrator clock which runs at a rate which is 16 times faster than the shortest element bit length, equivalent to a dot. For a speed of 10 words per minute, the element length is about 120 milliseconds; this means that the clock bits are about 75 milliseconds, an operating frequency of 133 Hz. The value of R1 can be varied to produce the desired speed; halving the value will double the speed.

A word about the feedback resistor used on this clock and the timer clock: Normally it should have a value of at least two times the R1 value. However, the very fast rise time of the B series CMOS (on the order of nanoseconds) caused erratic clocking of the CD4020 counters, with strange-sounding results in the CW output or inexact time intervals. Reducing the value of this resistor to 5600 Ohms cured the problem when nothing else availed. The problem was not encountered on the U2A/U2C tone oscillator, so the conventional value was used here.

The clock drives U3, a 14-stage CD4020 binary ripple counter. The Q4 to Q11 outputs of the counter (divide by 16 to divide by 2048) are connected to the address lines of the PROM, addressing memory locations 000 to 255 (00 to FF

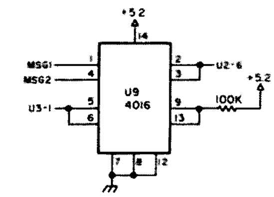


Fig. 2. Optional-message switch.

hex) in sequence. At each step, the PROM outputs four bits on its 9/10/11/12 pins. Only one of these bits is used in a memory cycle, normally bit 1, but any one of the four can be selected by strapping on the board. Alternative messages can be programmed in bits 2 to 4 locations, or a continuation of the message in the 256 bit 1 locations, using the optional memory switch.

A tone oscillator, U2A/U2C, identical to the counter clock except for the operating frequency (and the use of NANDs in place of

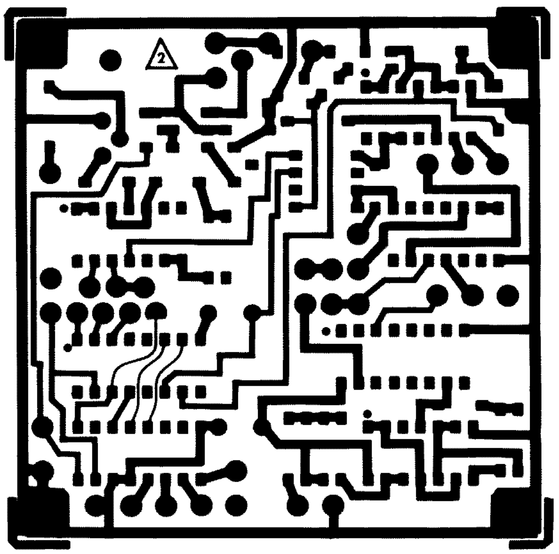


Fig. 3. Circuit board, foil side.

NORs), feeds one input of the U2B two-input NAND gate. The bit output of the PROM feeds the other input, keying the tone on and off at the output of U2B. The tone level control is used to adjust the level of the signal into the 10k series resistor which is bridged on the repeater audio line. Sufficient level is available to cover the majority of setups likely to be encountered.

A number of the counter outputs are made available for connection to a reset circuit consisting of U2D and U8D, used to stop the operation of the identifier after the programmed message has been sent. One or two of these outputs are strapped to the inputs of U2D as required, the two inputs being bridged together if only one output is used. The selectable message lengths are:

- maximum 64 bits: strap to output pin 14.
- maximum 128 bits: strap to pin 15.
- maximum 192 bits: strap to pins 14 and 15.
- maximum 256 bits: strap to pin 1.

The RC network between U2D and U8D delays and stretches the reset pulse applied to U7A, avoiding a possible race condition which could occur because of the slow reset time of the U3 counter.

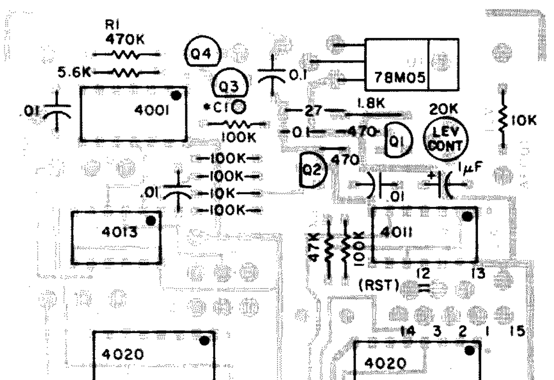


*Fig. 4. Circuit board, component side. *C1, 0.1 uF if required. **Tack-solder 100K resistor from "memory" common to ground, on front or rear of board.*

The Timer Circuit

The external keying input to the timer uses a 1k series resistor when keyed from a dry circuit (such as relay contacts). When keying from the collector circuit of a transistor, replace this resistor with a 1N4148 small signal diode to provide isolation from the collector voltage.

A low on the input to U5D inverter from the keying line produces a high on its output, starting the timer-clock, U5B/U5C, a third astable multivibrator circuit. The following U5A inverter puts a low on the U6 4020 counter reset line and one input of U8C NOR gate. This low enables the counter and is inverted by U8C to turn on the Q3/Q4 Darlington pair, keying the PTT line to ground. Q3/Q4 are capable of driving external loads up to 12 volts, 50 mA. Relay coils should have a parallel reverse protection diode to prevent voltage spikes from damaging the transistors.

The counter clock has a normal pulse width of 15 milliseconds. The three counter outputs provide timed periods of 30 milliseconds, 30 seconds, and 4 minutes, which are the intervals required for the following modes of operation:

- Mode 1 (Straps A, C, E, G): Provides COR timeout of 4 minutes, ID after 30 seconds; will continue to identify every 60 seconds even after timeout, as an indication that the keying input is still seized.
- Mode 2 (Straps A, C, E, H): Will ID after 30 seconds and every 60 seconds thereafter; no timeout function.
- Mode 3 (Straps A, D, E, G): Same as mode 1 except that ID does not continue after timeout.
- Mode 4 (Straps B, C, F, H): Identifies after each transmission, no timeout function.
- Mode 5 (Straps B, C, E, H): Identifies after a transmission, but only if the keying input has been seized for a minimum of 4 minutes; no timeout function.

U7A and U7B D-type flip-flops act as latches, storing the state of the counter outputs for control of the identifier and the PTT line. When strap G is inserted, U7B Q output provides the timeout function via the U8C two-input NOR gate. Strap H is used when timeout is not required, relegating U8C to the function of an inverter for the keyed output of U5A.

The U7B $\overline{Q}$ output is used (1) to disable the ID cycle on timeout (option 3), (2) to provide an ID after each transmission (option 4), or (3) to provide an ID after 4 minutes (option 5), by clocking the D (data) input of U7A.

U7A's Q output is tied to the base of Q2, turning on +5 volts to power the PROM during ID, and to the base of Q3, keying the PTT line while the ID is being sent. The $\overline{Q}$ output controls the ID counter, starting the address count, and stopping it when reset occurs via U2D/U8D. Time-delay capacitor C1, 0.1 uF, should be equipped when options 4 or 5 are used.

When the U5A input is unkeyed, the input(s) of U8C go from low to high, removing the Q3/Q4 ground from the PTT output. The same change of state resets the U6 timer counter and the U7B timeout latch and stops the U5 timer clock.

Voltage Regulator Circuit

U1 is a ½-Ampere, 5-volt regulator chip. Heat-sinking of the package is not neces-

sary since the standing drain of the CMOS circuitry is very low, about 8 mA, and the heavier load of the PROM is short term since it is turned off when not required. This feature allows use of the timer/identifier even with low-power-drain repeaters operating from solar cells, batteries, etc. The output of the regulator is set at 5.2 volts by bringing the common lead slightly above ground with a 27-Ohm resistor. This offsets the voltage drop of about 0.2 volts through the PROM switch and, although not strictly necessary, was added because of the simplicity of doing so. The remainder of the circuit runs on the full 5.2-volt output. The input to the board can be anything in the range of 7 to 20 volts positive.

Optional Message Switch

This feature permits messages up to 512 bits in length to be sent by switching the PROM output to an alternative track after the first 256 bits have been transmitted. The address scan of the counter is recycled for the second track. The switch is mounted on a piggyback board over the main PC board and may be made of perfboard or any other suitable material. A PC board is not really necessary because of the simplicity of the circuit; six connections to the main board are required.

A CD4016 quad analog switch, of which three sections are used, is the base of the message switch. The MSG1 and MSG2 outputs of the PROM (or any two as selected) are routed through switches 1 and 2. Switch 1 is normally closed via a high on U9-13 from the +5-volt line through 100k. Switches 2 and 3 are open because of a low condition on U9-5 and U9-6. MSG1 is routed to the output.

When a count of 256 is reached, U3-1 goes high, turning on switches 2 and 3. MSG2 is now routed to the output. The closure of switch 3 to ground pulls the switch 1 control line low, removing MSG1 from the output. The address lines to the PROM recycle through all the 256 addresses or less, depending on the reset strapping, sending the second portion of the message. The reset-strapping options for messages over 256 bits long are:

- maximum 320 bits: strap to output pins 1 and 14.
- maximum 384 bits: strap to pins 1 and 15.
- maximum 512 bits: strap to pin 2.

The circuit could presumably be extended on the same principle for message lengths up to the full 1024-bit capacity of the PROM; however, few applications would require messages of this length. The average repeater ID requires considerably less than 256 bits.

Programming Considerations

The circuit as designed uses tri-state 256×4 PROMs such as the TI 24S10, Signectics 82S129, National 74S287, or their equivalents. This avoids the use of external pull-up resistors required with open-collector-output versions. The TI 24S10, which we used, requires that you burn those bits which are zeros in the message; that is, you burn the spaces and skip the dots and dashes. Other chips may require the opposite condition to this and it is best that you check the data sheet for the one you are using before proceeding to program it.

A delay of three or four bits should be programmed as spaces at the beginning of the message to allow the PROM voltage and the counter to stabilize, avoiding missing bits in the output. You will have to bum spaces from the last bit of the message to 1 bit beyond the reset point selected (at least with the TI chip).

To ease the construction work and programming, the authors are offering as a package a double-sided, plated-through circuit board plus a PROM programmed with the message of your choice, for $10.00. If you have any queries on the circuit, we would be glad to try to answer them as best we can. An SASE (US postage OK) would, as always, be appreciated. ■

Parts List

Integrated Circuits	**Resistors (¼ Watt)**
U1 78M05	1 27 Ohms
U2, 5 CD4011B	2 470 Ohms
U3, 6 CD4020B	1 1k
U4 PROM (see text)	1 1.8k
U7 CD4013B	2 5.6k
U8 CD4001B	3 10k
Transistors	2 47k*
Q1 2N3906 PNP	5 100k
Q2, 3, 4, 2N3904 NPN	1 130k*
	1 470k*
	1 20k PCB mount trimpot
Capacitors	**Diodes**
3 0.01 uF	1 1N4148
5 0.1 uF	(or 2—see text)
1 1.0 uF	
Fig. 2 Message Switch	**Miscellaneous**
U9 CD4016	1 16-pin DIP
1 100k resistor	socket (PROM)

* Values shown are nominal ones for clock-circuit frequencies specified in text.

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Quick Qwip Conversion Fax

Seeing is believing. A few dollars and a weekend will turn this surplus unit into a reasonable facsimile.

A relatively new piece of fax gear has reached the surplus market in large numbers. The Qwip® 1000 is a solid-state send/receive unit manufactured in the mid to late 1970s. Circuitry is virtually all IC chips, and common ones at that. These model 1000 machines are available currently because they were recently replaced with the newer and more sophisticated model 1200. The units look similar, but the electrical circuitry is vastly different.

The scope of this article is introductory. These units are certainly worthy of conversion for fax work, and since it is likely that the newer models will also show up as surplus in the near future, I'll try to cover the differences as well as the operational characteristics.

The Qwip units were designed originally for business office use and are easy to operate. The basic design includes a telephone handset cradle, called a coupler, for sending or receiving over long-distance telephone lines. In this way, contracts, manuals, and other documents may be transmitted immediately from one business office to another. At the sending unit, a document is placed on the drum and the selector switch over the drum is placed in the send mode. Each machine has a two-position send switch. In normal use, compatible with most other fax machines, the 6-minute send position is used. The alternate position is for a 4-minute send duration and should be used only with other Qwip machines set for that duration. As soon as the send button is pressed, the unit begins transmitting its image to another unit. That's all there is to sending.

On the receive end, the operator places an 8″×10″ piece of fax paper on the drum and sets the selector switch to receive. A one-way clutch knob located on the right side of the roller drum opens a lock rail on the drum. After the paper edge is placed in the roller clamp rail, the clamp is closed and the paper is secured to the drum. The other edge of the paper remains free, but may be taped down if desired. By prearrangement, a 6-minute or 4-minute speed is then selected to match that of the sending unit. Then the telephone handset is placed on the cradle.

In the receive mode, the drum and stylus do not operate until the unit senses the send signal of 2400 Hz. A 566 tone decoder then activates the drum circuit. The receive unit, once started, will continue to print until the read/write assembly traverses the drum, the phone line is cut off, or the unit is switched off.

Qwip units will not send or receive if the drum com-

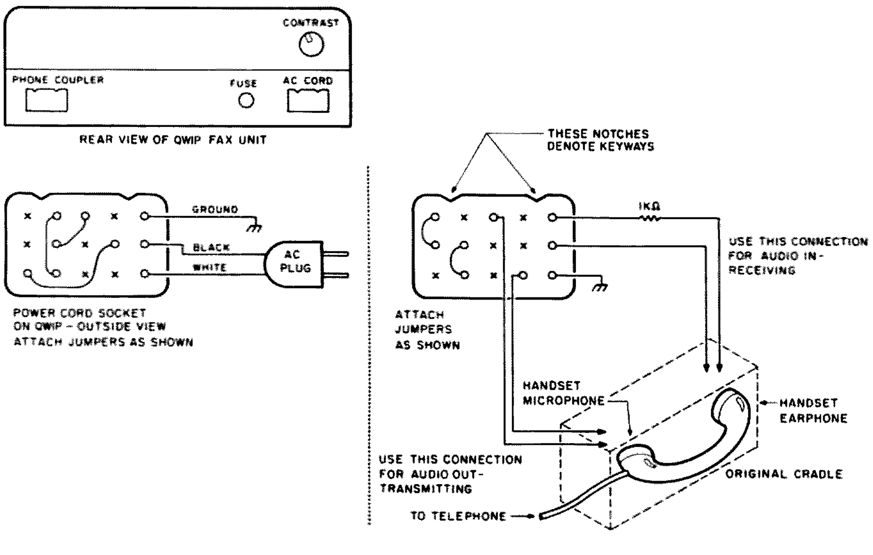


Fig. 1. Wiring connections for Qwip 1000/1200.

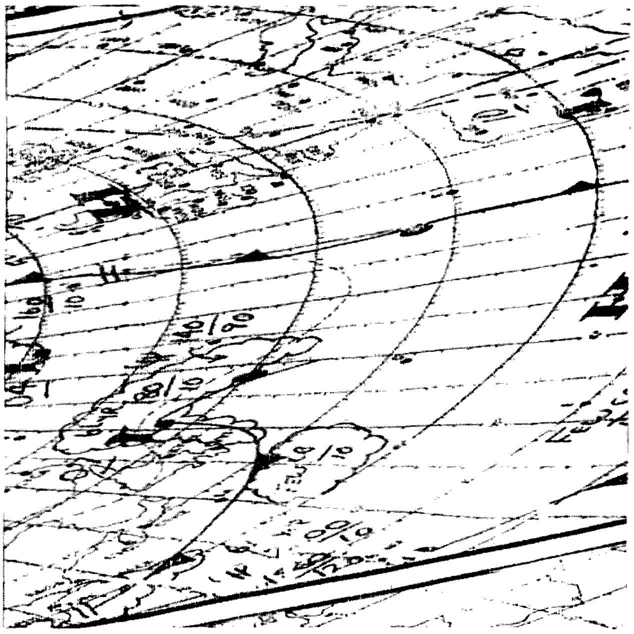
partment lid is left open. A reed switch activated by a magnet in the lid handle will idle the drum and circuits. At the end of normal operation, or in case of failure of some sort, a 555 timer chip buzzer will sound.

So much for normal operation. There are a couple of other minor controls and they are self-explanatory. As with any other piece of surplus, the Qwip units do not come complete with peripherals, namely, the ac patch cord and phone cradle, but for amateur radio or weather fax use this is no disadvantage.

The best way to ensure you'll get a working Qwip from surplus is to buy several and use 2 or 3 bad ones to make one good one. Reasons: For one thing, manuals and schematics are almost nonexistent. Also, many units have had holes drilled through crucial parts, wrecking each unit from a repair standpoint. Fortunately, the folks who drilled these never hit the same spot twice from unit to unit. In my case, I bought 2 units; one had holes in the circuit board, but the other only had a wrecked wiring harness. With one intact board and one good harness I soon had a like-new unit. I should mention that these units will require a good cleaning before they are fit to use.

The Qwip 1000s now available were brought in for repair but the dealers just gave out new 1200s in exchange. Any Qwip 1000 is bound to need repair. Most Qwips are sold with complaint cards still attached. One of mine read "noisy motor." The problem turned out to be a bent fan blade, remedied with an appropriate twist. A damaged wiring harness was the only other problem I uncovered. I recommend buying several units though, for another reason: The plug and socket connectors for the ac patch cord and phone cradle are interchangeable, and by robbing several Qwip units you can get a complete set of male/female connectors. As small as the Qwip units are, there is room to mount other plugs, if needed.

Fig. 1 shows the necessary plug/socket wiring. To make a Qwip unit workable, the jumpers must be added for normal use. (The view is of the outside of the Qwip.) This connection diagram will work for any model 1000 or 1200. The contacts identified as circles are used. The X contacts are unused. In tracing out the wiring harness to these sockets, you may find wires that go to these X pins, but do nothing. They may be removed or ignored.



A fax copy on HF (8.08 MHz) with bfo tuned to 2400 Hz. 120 rpm; a Qwip 1000 conversion.

Mechanical operation of the Qwip units is limited and there's not much to go wrong. The end bearings of the drum shaft should be inspected, lubricated, and if necessary, replaced. The stylus relay on top of the drum operates a copper stylus arm which holds a steel wire. Should the wire get broken or used up, it is very easy to repair. Just

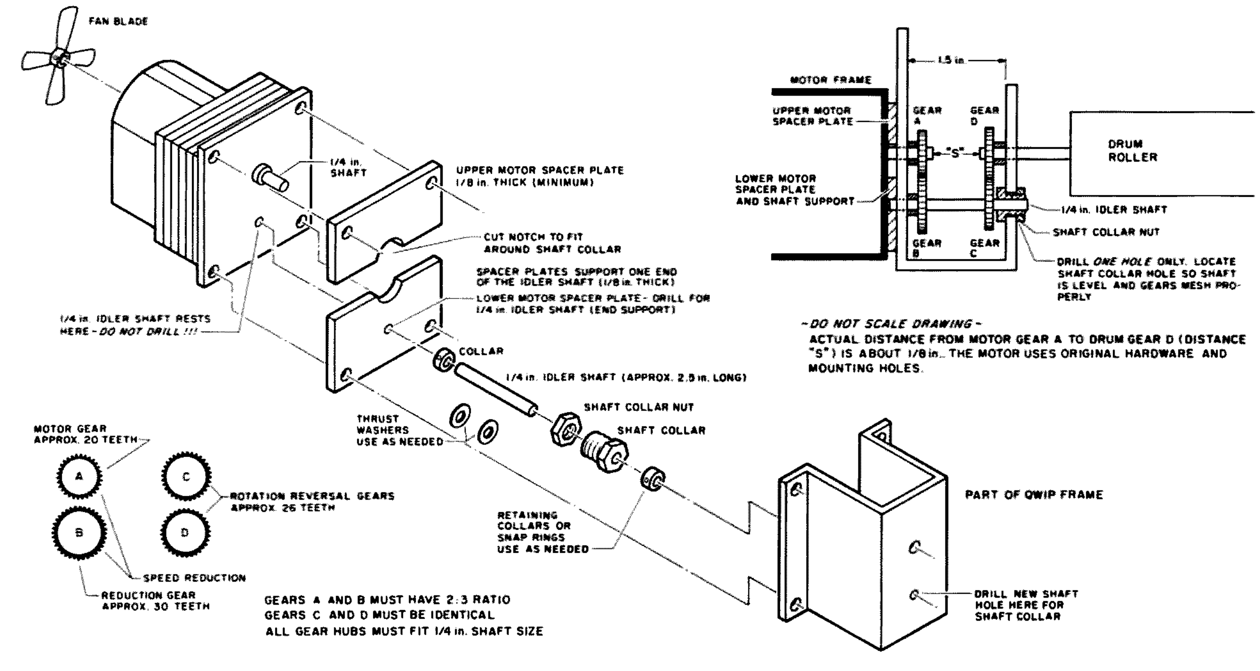
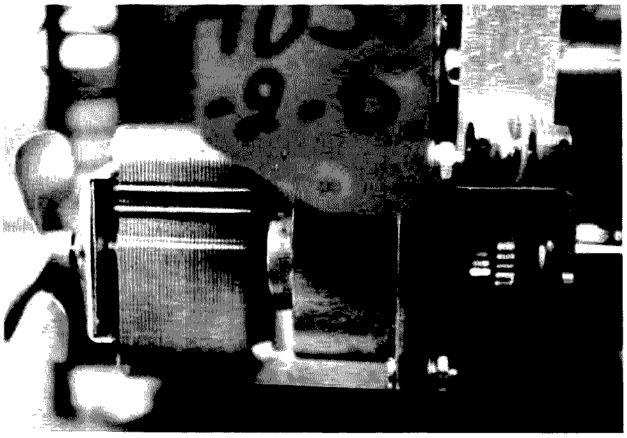


Fig. 2. Details for the 120-rpm speed conversion for the Qwip 1000.



Top view of the unconverted Qwip 1000 showing the original shaft coupler in place. Note the bent fan blade.

Top view of the converted Qwip 1000 and the original coupler that was removed. The motor will mount either right side up or, as here, inverted.

remove the copper contact arm and solder a bristle from a wire brush to it. Replace the copper arm and manually operate the relay to check for good contact with the drum. The steel wire should not contact the drum when the relay is deenergized.

The drum speed of the standard Qwip unit is 180 rpm, which is compatible with many other office-style fax machines. This speed is common on amateur radio frequencies, and once a Qwip unit is working properly it should be easy to interface it with radio gear for sending or receiving. Qwip paper is good for letters, callsigns, etc., but I recommend photocopy paper (Xerox®, etc.) for photographs.

An actual weather satellite image taken from a converted Qwip. Lake Winnipeg is in the upper left-hand corner.

The Qwip 1000 is mechanically similar to the 1200, but electrically they have little in common. The Qwip 1000 motor, for example, is a basic ac-synchronous mechanical motor, bulky and heavier than its 1200 counterpart, and it lends itself easily to speed conversion for weather work. By contrast, the motor in the 1200 series is a dc-driven servo-motor no larger than a C-size battery cell. Its speed is crystal-controlled and would be difficult to adjust without a technical manual. The Qwip crystal frequency for this motor is 20 kHz. The 1200 chassis sports a separate circuit board to drive the motor, consisting mostly of 7400-series circuit chips. The 1200 power transformer is bigger, no doubt to accommodate the added circuit board. In general, the wiring layout is cleaner on the 1200, and the pots contain more glue to secure their positions.

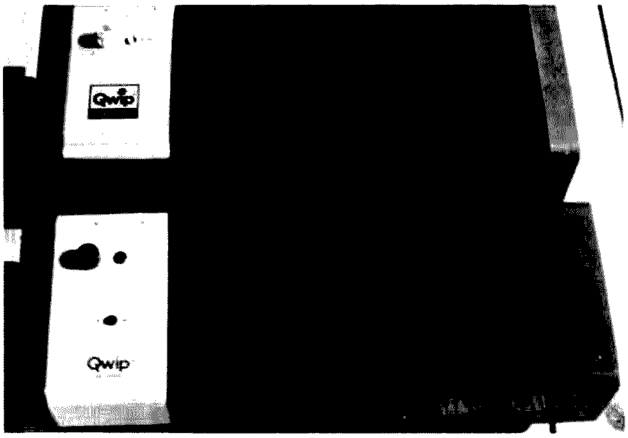
The main circuit boards look similar in both the 1000 and 1200, but the parts layouts change once you get past the power-supply diodes. None of the adjustment pots is captioned or identified. The few pots I could decipher were not located near the chip they control. The 1200 also has a switch labeled Compatibility Selector. For this, the circuit board contains an extra relay. In operation, the switch makes an LED flash for compatibility with a Qwip 1000 or burn steadily when it is to be used with another 1200.

For power, the Qwips produce two voltage levels. One is plus and minus 15 volts to drive the op amps, TTL chips (5 volts), and relays (12 volts). The other level is approximately 200–300 V dc for the stylus to burn the paper.

The one factor responsible for the Qwip 1000's early introduction to the surplus market had to be its mechanical design and the flaws therein. The Qwip 1000 used the same low-cost plastic material throughout its mainframe. This plastic held up poorly and suffered mechanical stress resulting in many cracks throughout the main subassembly—right where the drum roller functions, to be exact. Thus, the model 1000 series prob-

ably has flaws in the worst possible places for amateur fax work. Nor does the plastic material mend easily with glue—another reason for purchasing more than one.

The 1200 overcame this problem by changing the subframe material to a much stouter fiberglass. Along with an improved electrical design, the 1200 hosts a lighter-weight roller. Its bearings have less drag. The Qwip 1000 used a slotted roller with a cutting blade mounted in the read/write head. The 1200 model uses a smoother roller and no cutter, indicating that an improved phasing circuit has been added. Neither type of roller is made of electrically-conductive material. Grounding is achieved through a set of mechanical fingers which rest against the roller and are located at the very bottom of the machine. Partial conductivity can be made through the retaining clamp built into the drum roller, but this is not a good conductive path for the stylus. The 1200 is not a copper/steel assembly as used in the 1000 series; the 1200 stylus is a wire-filled fiber.



The Qwip 1000 (top) and the nearly-identical Qwip 1200.

Considering that the Qwip units cost several hundred dollars new and are going for fifteen to thirty now, the mechanical drive system alone is worth the asking price. The circuit boards are a bonanza for ICs and tantalum capacitors. Parts and component values are completely standard.

Like most fax machines made commercially, the Qwip machines easily lend themselves to modification. Fig. 2 shows a mechanical gear-reduction assembly that can be used for changing the drum speed to 120 rpm for weather fax operation. Although the gears are shown spread out, the actual assembly fits into an area narrower than a Band-Aid™ box. The drawing gives location details of the parts needed. Using the arrangement pictured there, the conversion requires only one *very carefully* placed hole to be drilled in the Qwip sub-chassis just under the drum-roller shaft hole. (This is another good reason to own more than one Qwip—practice.) Originally, the motor shaft was directly coupled to the drum shaft and this coupling can be restored if 180-rpm operation is ever desired again. The original motor mounting holes are preserved; the motor is just moved back a wee bit. This conversion requires some degree of care and patience, but is not difficult. The four gears necessary are all that need to be purchased. The other parts are fashioned from scrap.

About the gears: I have labeled them gears A, B, C, and D. A and B do the speed reduction but leave the quarter-inch shaft turning the wrong direction. Gears C and D are for direction reversal. They wouldn't be necessary except that the drum-roller shaft rides on a one-way bearing located at the right side of the Qwip subframe. As it turns out, the gears needed fit just fine with little effort.

Gear A is a Boston gear #H3220 and is the only gear that comes with a ¼-inch hub diameter. All others require hub bushings and they are reasonably priced. Gear B is a Boston gear #H3230. Gears C and D are identical. You might try Boston #3226, although you may need to go up or down one size in order to reach a proper fit. I did the whole conversion in one day, making it up as I went along. Once finished, conversion to or from 180 rpm takes just a few minutes.

In HF work where the transmit tone is 400 Hz, try using a bfo pitch tuned to 2400 Hz to activate the drum-rotation circuit. The bfo tone has almost no effect on picture quality. Signals are generally available on 8,080 and 10,865 MHz and produce good results on a Qwip.

The Qwip units will print from a whisper. It is all too easy to overdrive the input to the point where the drum will stop turning because the tone decoder is overloaded. A 100k trimpot is recommended for the input line. It should cure most troubles, although internal adjustments may also be required.

Judging by the many applications for which the Qwip components may be used and the very low price tag, the Qwip 1000 or 1200 could easily rank with the ARC-5 units as the surplus buys of the century. ■

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No-Etch Circuit Boards

Produce quality PCs with N6JH's cut-and-pry technique.

One of the more persistently recurring problems with home-brew projects is making printed circuit boards. Amateurs have used many approaches to this dilemma, and numerous articles describe schemes ranging from the most sophisticated photographic and etching techniques to the crudest methods of drawing the traces directly on a board. But one of the more overlooked ways to make prototype boards is to bypass entirely the printing and etching and directly cut the conductive traces by hand.

Many of the boards used by amateurs, especially for high-frequency work, are simple. They have few traces, the trace widths are relatively large, the traces are mainly or entirely on one side of the board, and the required tolerances are not especially critical. Such designs are easily and quickly produced by a direct method which requires only a sharp knife and a soldering iron. This article describes how to make such boards and illustrates the process with a hand-cut rf board.

This process involves four basic steps: preparing the artwork used to guide the cutting, scoring the traces, peeling away undesired copper, and building the final circuit. Each of these steps will be described in detail.

Preparing the Artwork

The first step in hand-cutting a board is to decide where to cut. The best approach is to prepare a drawing of the desired circuit traces which can be used to guide the knife. This can be done a number of ways. If, for example, the circuit to be built is described in a magazine article which includes a printed-circuit-board pattern, this pattern itself, or a photocopy, can be used. Alternatively, a design can be drawn on paper and used as the guide.

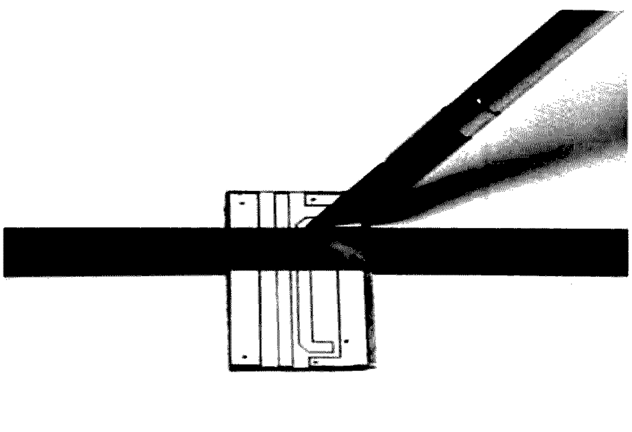

Photo A. The paper artwork has been cemented to the copper-clad circuit-board stock, and a steel ruler is used to guide the razor knife along straight lines to score the copper.

If the design is to be transferred from a magazine page, it is best to make a photocopy. This not only preserves the original in case more than one board is needed, but also it gives better results because the paper used in magazines is usually too thin and slick, while a sheet of photocopier paper will be less likely to wrinkle during cutting.

If you are making your own drawing, it is best to make it larger than final size to reduce drafting tolerance errors. This, of course, is the technique used in the normal photographic production of printed circuit boards, where the artwork is typically two or four times as large as the final board. In photographic work, a large studio camera is used to make the reduction, which produces a very accurate reduced image. This accuracy is not needed for hand-cut boards, so we can use a simpler and less expensive technique.

The key to a simpler and cheaper reduction lies in the widespread availability of photocopiers which can reduce the size of an original document. This feature is designed to make it possible to print large documents on small paper and was never intended for the production of accurate artwork, but it serves well enough for our purposes.

Photocopiers with reduction capability typically reduce by at least two different factors. The two most common appear to be 77% and 64%. If original artwork is reduced by 77% and the resultant copy is itself further reduced by 64%, the final copy is smaller by a factor of .77 × .64 = .493. Thus, if the original was twice the desired final size, the second copy will be the desired size with a deviation of only a few percent.

No matter which approach is used to produce the artwork, the next step is to cut it out and paste it directly onto the circuit board's copper surface. One of the better glues for this seems to be regular rubber cement. This glue quickly sticks the paper to the copper, the artwork can be smoothed to remove air bubbles, and the paper is firmly held during cutting. After cutting, the paper is easily peeled away; the rubber cement leaves no residue to interfere with soldering.

Up until now the assump-

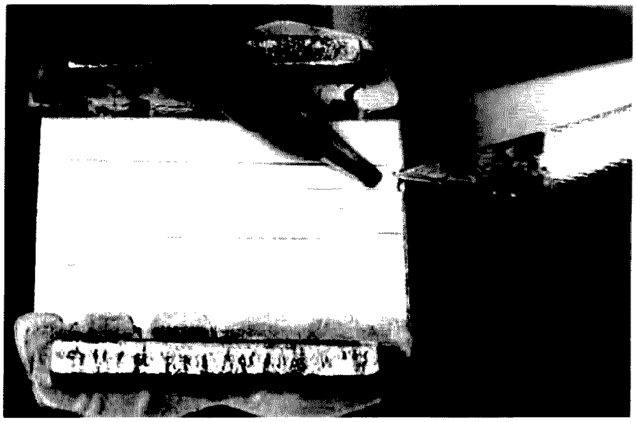

Photo B. The copper to be removed is first lifted at one end by simultaneously heating the area and sliding a knife point under the piece.

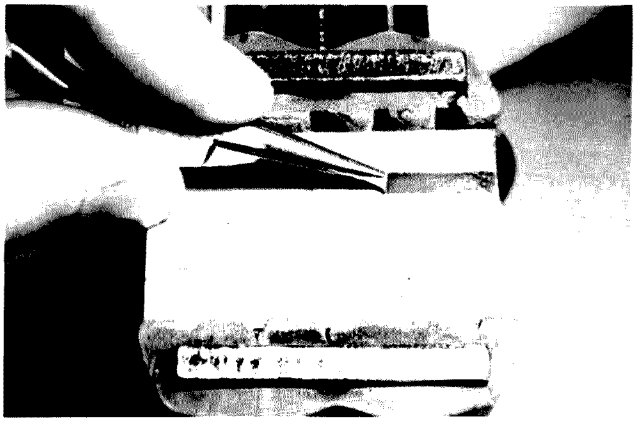

Photo C. After the edge of the copper strip is lifted a bit, grasp it with a pair of needle-nose pliers and smoothly peel away the strip.

tion has been that the circuit traces are found on only one side of the board, and that the other side is either blank (a single-sided board) or is covered with an unbroken ground plane (as is common in rf microstrip circuits). If traces must be cut on both sides, some way to align the two sides is needed. One way to do this is to drill a few alignment holes as aids in lining up the two sides. Other than this, production of a two-sided circuit is the same as a single-sided board.

Cutting the Traces

Once the paper pattern has been glued to the surface of the board, the next step is to score the edges of the traces. This step requires a sharp knife, a steel ruler, and a bit of care.

The best knife to use for cutting the traces is a hobbyist's razor-edge knife. This knife should have a razor-sharp blade stiff enough so that moderate pressure can be applied to score the copper. It should also have a handle—don't try to cut with a bare razor blade or the results could be gory.

It is at this point that you realize the advantages of circuit traces which are straight lines. The steel ruler serves as a guide for the knife blade when cutting straight lines and provides maximum accuracy. Curves can be cut, but they must be cut freehand, or else some type of cutting jig must be found. A drafting "French curve" would probably serve. No matter what type of guide is used, it seems best to apply moderate pressure and to go over the line to be cut several times. If cutting freehand, make the first cut for accuracy and then go over that scored line several times. The object is not necessarily to cut all the way through the copper, but rather to produce a heavy score line along which the undesired copper can be peeled away.

Go over all of the lines to be cut and check to see that none has been missed; once the paper has been peeled away, it is harder to add missed traces. Next, use a center punch or awl to dimple the copper at all the locations where holes are to be drilled.

Photo A shows the first steps of the cutting process. A simple rf board, in this case a microstrip directional coupler for the 1296-MHz band, has its photocopied artwork glued to the copper. The knife is guided along the lines by the ruler to accurately score the traces.

Now strip off the paper artwork and remove any of the rubber cement which remains on the board. A rubber pencil eraser works well to roll any remaining bits of glue off the copper. Inspect the board to see that none of the lines or hole guides has been forgotten.

Peeling Off Unneeded Copper

The next step involves removing the undesired areas of copper. This is easily done with the point of the razor knife and the aid of some heat from a soldering iron.

Printed-circuit-board material has a surface layer of copper glued to a fiberglass base material. If the copper is heated a bit, the glue's grip is greatly reduced, as anyone who has ever "lifted" a printed circuit pad has discovered. This tendency can be used to our advantage, though.

Apply a bit of heat to the edge of one of the copper pieces to be removed, and at the same time gently slide the point of the knife under the edge of the copper. The copper will lift easily in the heated area. Lift a large enough piece of copper so that a pair of needle-nose pliers can get a grip. Photo B shows the edge of a trace being lifted this way.

Then, without using more heat, a strip of copper can be gently pulled away from the board, as shown in Photo C. With some care, a large piece of copper can be stripped away. Usually the stripped piece will break when a scored line is reached. At this point, use the knife and soldering iron to again lift a corner and continue with the pliers.

Sometimes the most difficult part of stripping away the undesired copper is to avoid removing circuit traces. In the effort to carefully remove small areas of copper, it is easy to lose sight of the larger picture and remove desired pieces as well. To avoid this, color in the areas to be saved with a felt-tip marker before peeling.

After all of the excess copper areas have been removed, drill all of the holes in the board using the dimples as drill-centering guides. Clean the board with rosin flux remover, and it is ready for assembly.

Summary

Prototype circuit boards can be produced quickly by using these simple techniques. With practice, nearly any board can be cut by hand, not only simple rf boards, but more intricate analog and digital circuitry as well. The results, while not up to the standards of printed circuit boards, are nevertheless satisfactory for many amateur projects; the low cost and rapidity of the method are unbeatable! ■

Disco Duckie?

Try some dirt-cheap headphones for your HT.

Carl Peterson N6CSI
PO Box 4432
Chico CA 95927

If you are supplying communications for a parade or other event with a noisy background, a set of lightweight headphones is an asset, especially if you are tired of holding the speaker mike (SMC-24) up to your ear on a cold winter day. Borrow the stereo headphones from a Walkman-type radio and make the adapter in Fig. 1. If the headphone plug accidentally disconnects, it will automatically switch back to the speaker mike. Its resistance is 9.4 Ohms, and that of the the headphones used was 16.8 Ohms (in parallel). All parts were obtained from the local Radio Shack.■

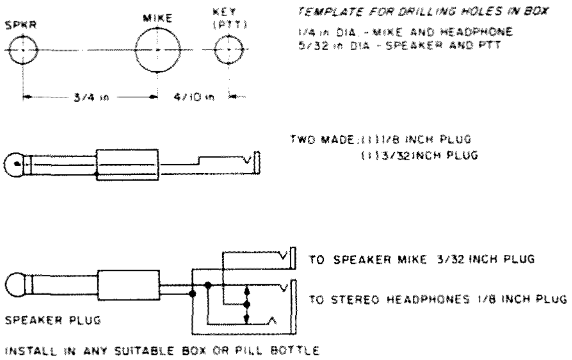

Fig. 1. TR-2400 modification.

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Colorado Springs CO 80918

Ntty Grtty RTTY

Tomorrow, to Morrow, is too late. Build this easy Timex/Sinclair interface today and be on the air tonight.

Many would-be RTTY enthusiasts no doubt are dismayed when they discover the potential high cost of quality RTTY gear. Although many inexpensive computers are on the market today, the cost of the interface and software usually far exceeds the price of the computer itself.

The Timex/Sinclair (T/S) computer is a very low cost, self-contained system. With an ordinary cassette recorder, a black-and-white television, and the transceiver interface system and software described in this article, you can have a complete RTTY terminal:

1) You will be able to transmit and receive Baudot code at 60, 66, 75, and 100 words per minute with a 170-Hz or 850-Hz shift, and

2) Receive 425-Hz shift commercial Baudot code broadcasts at all speeds listed above.

3) It will have a simple transmit/receive control with an optoisolated T/R switch,

4) LED indicators for high and low received tones, with carrier detect, for simple tuning,

5) 850-Hz and 170-Hz six-pole active bandpass filters to combat QRM, and

6) An audio frequency-shift keying (FSK) monitor during transmit to ensure that the typed character is sent.

7) Everything is powered by the T/S computer power supply.

At today's prices, the computer and interface circuit together will cost about $100.

The software and a full-display screen will fit into the 2K of random-access memory (RAM) provided with the Timex/Sinclair TS-1000 with no modifications required to the com-

Photo A. The Timex/Sinclair computer, along with a TV, cassette recorder, interface unit, and a transceiver, make up the complete RTTY station.

Photo B. The interface unit is versatile enough for the various amateur and commercial RTTY code-reception schemes, as well as 170-Hz and 850-Hz transmission using standard mark and space frequencies. Note the toroid rf chokes on the computer power and video cables.

puter itself. My software went into a Sinclair ZX81 which I converted to 2K of RAM through a simple chip substitution described in this article.

I have learned to touch-type on the Sinclair's membrane keyboard and seem to do about 30 wpm. For heavy use, you will probably want to attach one of the after-market full-stroke keyboards.[1]

If you are unfamiliar with the mechanics of RTTY, you might want to read the introductory article by W9IF[2] for an excellent explanation of the basics.

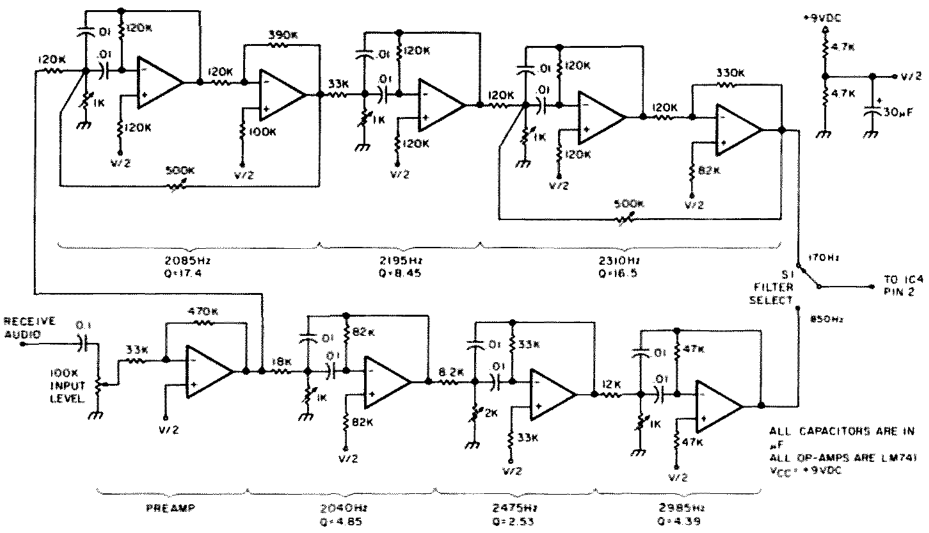

Fig. 1. Schematic of the 170-Hz and 850-Hz active bandpass filters.

FSK Receiver

The receiver section of the RTTY interface is built around a high-quality filter section followed by a phase-locked-loop (PLL) tone-decoder chip. Low-level audio tones are amplified by the 741 preamp (Fig. 1) and then processed by selectable six-pole bandpass filters for either 170-Hz or 850-Hz shifts. The filters are based upon a design by K2OAW[3] and go a long way toward eliminating nearby QRM. Be sure to use polystyrene or mylar™ capacitors on the op amps for temperature stability. K2OAW also recommends the use of single 741 op-amp packages rather than the dual or quad types. The passband of each filter stage is calculated by dividing the center frequency by

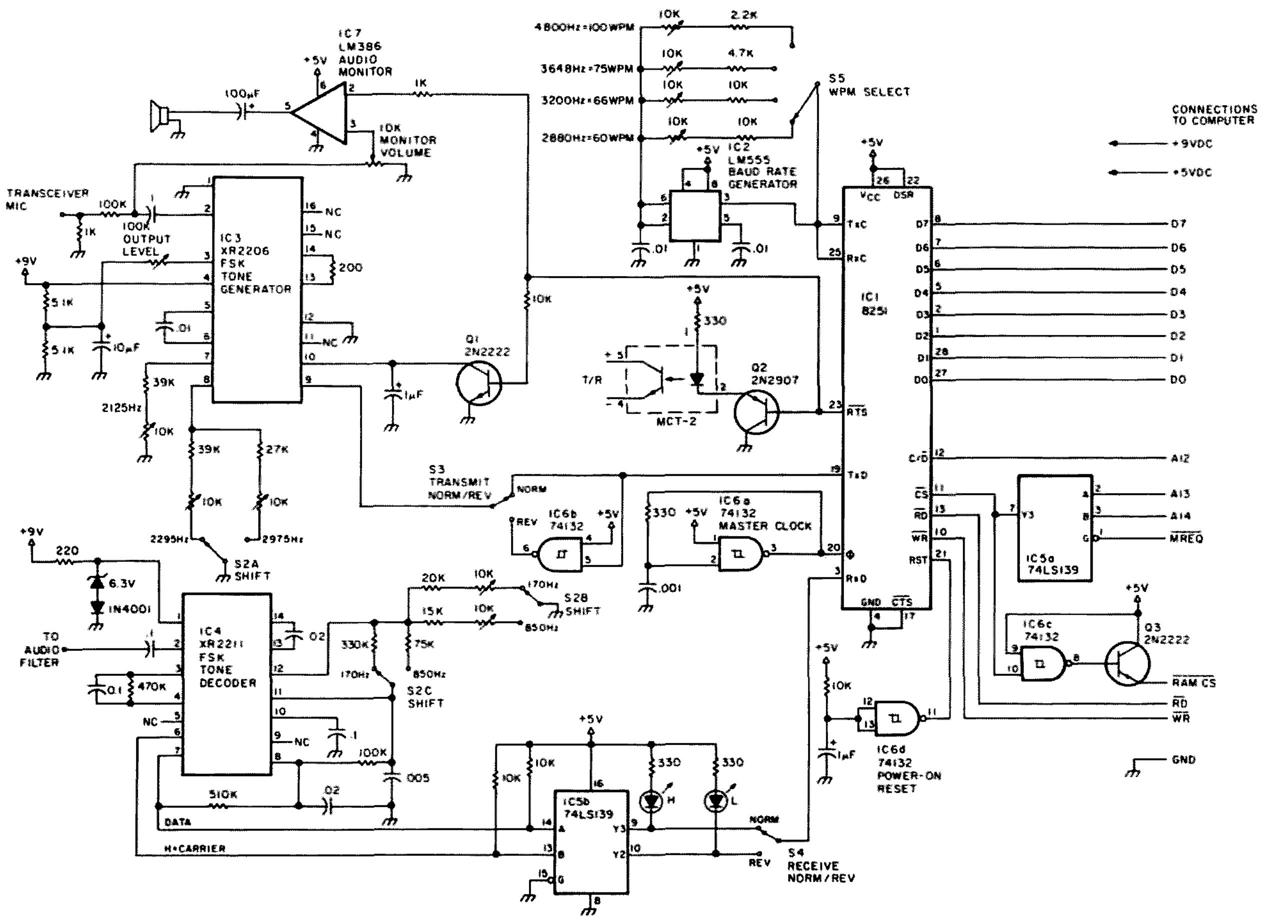

Fig. 2. Schematic of the computer interface circuit, along with the RTTY tone encoders and decoders.

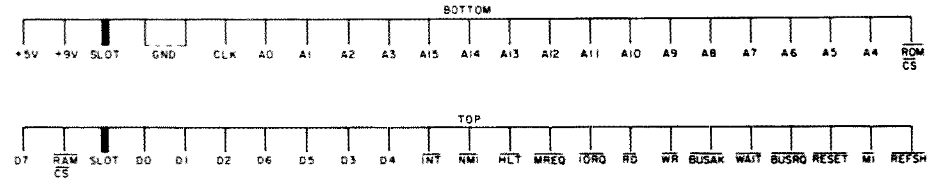

Fig. 3. Timex/Sinclair computer rear-connector pinout diagram. This diagram applies to both the ZX81 and TS-1000.

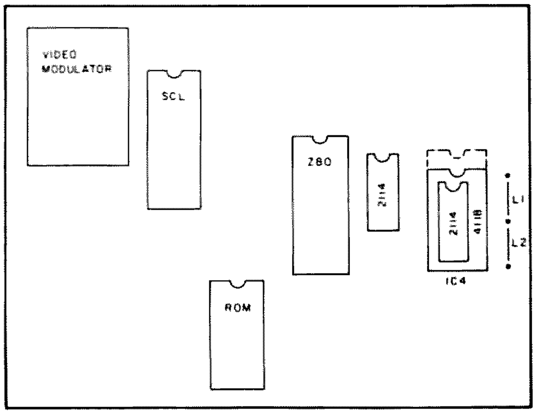

Fig. 4. ZX81 computer circuit-board integrated-circuit layout. To convert the computer RAM to 2K, remove the 2114/4118 chip(s) and replace with a 2016 or 6116 chip at location IC4. Ensure jumper L1 is open, and connect a wire across L2. Parts are available from Jameco Electronics, 1355 Shoreway Road, Belmont CA 94002.

the Q, both of which are given in Fig. 1 for each filter stage. If you have the proper i-f filter in your receiver, you can eliminate the audio bandpass filters, but since these are tailor-made for RTTY, you may want to include them anyway.

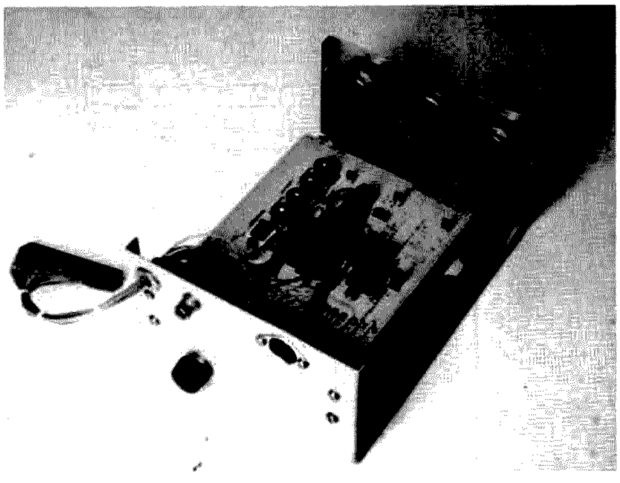

Photo C. The interface circuit was built on proto boards available at Radio Shack. The top board (shown) contains the digital portion of the circuit while the lower board contains the filters and tone generator and decoder chips. No printed circuit board is available. The DIN socket is used for the cable to the mike jack on the transceiver, and a standard phono patch cord connects receiver audio to the phono jack. Both of these cables should also have toroid chokes attached to prevent RFI. The knob on the rear panel controls the audio-monitor volume.

The appropriate filter is selected by S1, which sends the tones to the input of the XR-2211 tone decoder (Fig. 2).[4,6] S2b and S2c select 170-Hz shift tones for HF amateur RTTY or 850-Hz shift tones for both VHF amateur and 425-Hz shift commercial signals. The zener regulator on pin 1 of IC4 eliminates ripple from the T/S computer's 9-V supply for reliable decoding.

The carrier detect and data lines of IC4 are sent to IC5b, which provides normal and reverse logic data through S4. At this point, the frequency-shifted audio has been converted to TTL-compatible logic levels. The two LEDs on the output pins of IC5b indicate high and low tone frequencies present at the input of the decoder. If proper audio tones are not present at the input to IC4, the carrier detect line is pulled low and both LEDs are extinguished. This system takes the guesswork out of tuning the RTTY station properly.

8251 Programmable Communications Interface

The Baudot-encoded serial data is now sent to pin 3 of IC1, an Intel programmable communications interface chip.[7] This device assembles a complete 5-bit character from the serial data at pin 3 and signals the Z80 central-processor unit (CPU) of the T/S computer during the next status read operation. The CPU then performs a data read and accepts a complete character to be decoded and dis-

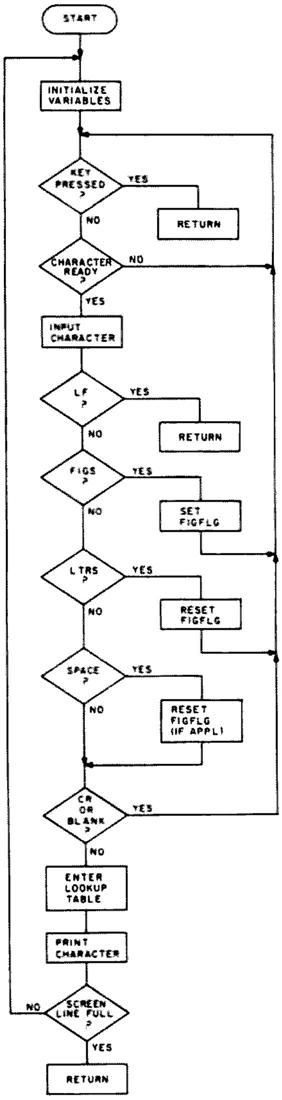

Fig. 5. Flowchart for the receive portion of the assembly code.

played. The T/S computer cannot perform the serial-to-parallel character conversion itself, in real time at least, because the majority of its computation time is used to generate the display and a portion of nearly every character would therefore be lost Of course, the 8251 chip solves this problem neatly. For more information on the 8251, you should refer to the *Intel Microcomputer Data Book*.

IC6a provides a master clock of about 1 MHz for the 8251, and IC2 is an astable multivibrator acting

ADDR	CODE	MNEMONIC	COMMENT
4082	16 00	LD D,00H	Addr 4082H or 16514_{10}
4084	06 20	LD B,20H	
4086	21 49 41	RLOOP: LD HL,FLG	Addr 4149H
4089	3A 25 40	SLOOP: LD A,(LAST_K)	Addr 4025H
408C	3C	INC A	
408D	C0	RET NZ	Return if key pressed
408E	3A 00 70	LD A,(7000H)	8251 chip status
4091	CB 4F	BIT 1,A	Data available?
4093	28 F4	JR Z,SLOOP	Jump if no
4095	3A 00 60	INCHR: LD A,(6000H)	Input chr from 8251
4098	FE 02	CP 02H	LF?
409A	C8	RET Z	Return if yes
409B	FE 1B	CP 1BH	FIGS?
409D	20 04	JR NZ,LCK	Jump if no
409F	CB EE	SET 5,(HL)	Set FIGFLG
40A1	18 E6	JR SLOOP	
40A3	FE 1F	LCK: CP 1FH	LTRS?
40A5	20 04	JR NZ,SPCK	Jump if no
40A7	CB AE	RES 5,(HL)	Reset FIGFLG
40A9	18 DE	JR SLOOP	
40AB	FE 04	SPCK: CP 04H	SPACE?
40AD	20 02	JR NZ,DEC	Jump if no
40AF	CB AE	RES 5,(HL)	Reset FIGFLG (if appl)
40B1	86	DEC: ADD A,(HL)	Offset 32 if FIGFLG set
40B2	5F	LD E,A	
40B3	E6 17	AND 17H	CR or BLANK?
40B5	28 D2	JR Z,SLOOP	Jump if yes
40B7	19	ADD HL,DE	Enter lookup table
40B8	4E	LD C,(HL)	
40B9	79	LD A,C	
40BA	D7	RST 10H	Print chr (ROM routine)
40BB	10 01	DJNZ 01H	32 chrs printed?
40BD	C9	RET	Return if line complete
40BE	18 C6	JR RLOOP	

Fig. 6. Receive assembly-code listing.

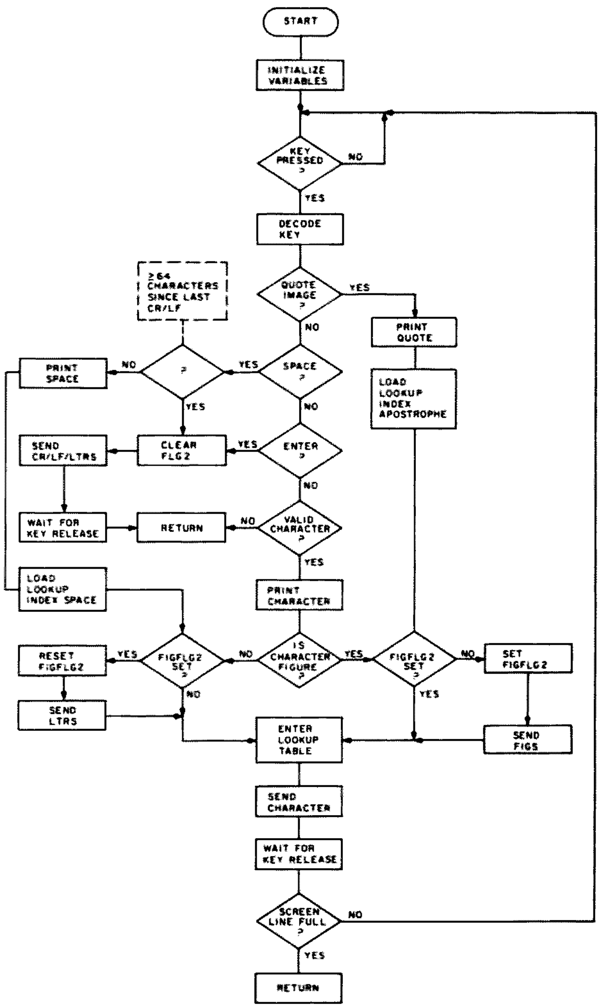

Fig. 7. Flowchart for the transmit portion of the assembly code.

as a baud-rate generator for 60-wpm (45-baud), 66-wpm (50-baud), 75-wpm (57-baud), and 100-wpm (75-baud) data rates. A power-on reset pulse is provided by IC6d. The 8251 chip is selected through IC5a; during this time the internal T/S computer memory is disabled by IC6c and Q3.

FSK Generator

When transmission begins, the 8251 is given a command by the CPU and pin 23 is driven low, causing the optoisolated T/R switch to close and the audio monitor (IC7) to come on. Also, the XR-2206 tone generator (IC3) is activated when Q1 cuts off. The tone generator and monitor do not operate during receive to avoid interference to the tone decoder.

When a valid Baudot character is entered on the computer's keyboard, this character is loaded into the 8251 which clocks the data serially out of pin 19, through the normal/reverse switch, S3, and to pin 9 of IC3. This function-generator chip produces a 2125-Hz mark tone when pin 9 is low and a selectable 2295- or 2975-Hz space tone when pin 9 is high.[5,6] The mark and space tones are inverted when S3 is set to reverse. The selector switch, S2a, is ganged with S2b and S2c to ensure identical receive and transmit shifts.

Hardware Construction

Be sure to build the interface circuit in a metal box (Photo B), and keep the wires to the T/S computer short or you won't believe the RFI you'll get. A 46-pin .100-inch-spaced edge-card connector for the T/S computer back-panel can be made by cutting down a Radio Shack 276-1545. The required computer signals can be tapped off this connector by referring to Fig. 3.

Note the toroid-core chokes on the power and display wires to the computer and on the transmit and receive lines to the rig. These chokes help keep computer noise out of the rig and transmit rf out of the computer. With my system as shown, computer noise in the receiver is virtually nil, and 100 Watts of continuous RTTY-transmit power will not affect computer operation. If you have RFI trouble, try changing equipment positions, ground connections, antenna location (if possible), and the number of turns of wire on the toroid chokes.

The adjustment procedure is straightforward. Set each filter pot (Fig. 1) for the desired response; the 1k and 2k pots adjust center frequency and the 500k pots on the 2085-Hz and 2310-Hz sections adjust the Q. The single-stage filter elements all have their Q fixed at the value shown on the schematic. Set the pots on the 555 (IC2) and the XR-2206 (IC3) for the frequencies shown (Fig. 2). You can activate the XR-2206 by temporarily grounding the base of Q1. Now feed the transceiver mike signal from IC3 to the input of IC4 and adjust the two pots on S2b for reliable switching while using the LEDs as indicators. As an alternative, an audio generator will allow more precise alignment of IC4.

The two pots on S2b should be set so that the data (IC4 pin 7) changes logic level when the input tone frequency is about halfway between the respective mark and space frequencies for the 170-Hz and 850-Hz shifts. Also, ensure that the carrier detect (IC4 pin 6) is pulled high for the mark and space input tones.

Assemble the jumper cables between the interface box and your rig. I used a

DIN socket on the box and a 2-conductor shielded cable between the box and my transceiver mike jack. Be sure to add the toroid choke before soldering the DIN plug onto the interface box end of the cable. A common stereo patch cord with phono plugs on each end carries the receive audio from the rig to the interface box.

ZX81 2K RAM Modification

If you intend to use the ZX81 computer in your RTTY system, you'll need to replace the 1K RAM chips with 2K of RAM to make room for the software and display requirements. (The TS-1000 already has 2K of RAM, so skip this section if you have one of these computers.)

ADDR	CODE	MNEMONIC	COMMENT
40C0	16 00	LD D,00H	Addr 40C0H or 16576_{10}
40C2	06 20	LD B,20H	
40C4	C5	WKEY: PUSH BC	
40C5	ED4B2540	LOOP: LD BC,(LAST_K)	Addr 4025H and 4026H
40C9	0C	INC C	
40CA	28 F9	JR Z, LOOP	Loop if no key pressed
40CC	0D	DEC C	
40CD	CD BD 07	CALL 07BDH	Decode key (ROM routine)
40D0	C1	POP BC	
40D1	4E	LD C,(HL)	
40D2	79	LD A,C	
40D3	21 89 41	LD HL,FLG2	Addr 4189H
40D6	FE C0	CP C0H	Code "" (quote image)?
40D8	20 07	JR NZ,NOAP	Jump if no
40DA	3E 0B	LD A,0B	Code "
40DC	D7	RST 10H	Print " (ROM routine)
40DD	1E 36	LD E,36H	Lookup table index, apostrophe
40DF	18 32	JR FIGS	
40E1	A7	NOAP: AND A	Code SPACE?
40E2	20 0A	JR NZ,NOSP	Jump if no
40E4	4E	LD C,(HL)	
40E5	CB 71	BIT 6,C	64 or more chrs sent since CR/LF?
40E7	20 0A	JR NZ,CR/LF	Jump if yes
40E9	D7	RST 10H	Print space (ROM routine)
40EA	1E 37	LD E,37H	Lookup table index, space
40EC	18 31	JR LTRS	
40EE	3D	NOSP: DEC A	
40EF	FE 75	CP 75H	Code ENTER?
40F1	20 14	JR NZ,FCHR	Jump if no
40F3	72	CR/LF: LD (HL),D	Clear FLG2
40F4	0E 08	LD C,08H	Baudot code CR
40F6	CD 3E 41	CALL XMTCH	Send CR
40F9	0E 02	LD C,02H	Baudot code LF
40FB	CD 3E 41	CALL XMTCH	Send LF
40FE	0E 1F	LD C,1FH	Baudot code LTRS
4100	CD 3E 41	CALL XMTCH	Send LTRS
4103	CD 37 41	CALL NOKEY	Wait for kev release
4106	C9	RET	
4107	3C	FCHR: INC A	
4108	FE 40	CP 40H	Valid key press?
410A	D0	RET NC	Return if no
410B	D7	RST 10H	Print chr (ROM routine)
410C	D6 0A	SUB 0AH	Align code with lookup table
410E	5F	LD E,A	
410F	FE 1C	CP 1CH	Is chr a figure?
4111	30 0C	JR NC,LTRS	Jump if no
4113	4E	FIGS: LD C,(HL)	
4114	CB 79	BIT 7,C	FIGFLG2 set?
4116	0E 1B	LD C,1BH	
4118	CC 3E 41	CALL Z,XMTCH	Send FIGS if no
411B	CB FE	SET 7,(HL)	Set FIGFLG2
411D	18 0A	JR LOCCH	
411F	4E	LTRS: LD C,(HL)	
4120	CB 79	BIT 7,C	FIGFLG2 set?
4122	0E 1F	LD C,1FH	
4124	C4 3E 41	CALL NZ,XMTCH	Send LTRS if yes
4127	CB BE	RES 7,(HL)	Reset FIGFLG2
4129	34	LOCCH: INC (HL)	Update chr count
412A	19	ADD HL,DE	Lookup table index
412B	4E	LD C,(HL)	Enter lookup table
412C	CD 3E 41	CALL XMTCH	Send chr
412F	CD 37 41	CALL NOKEY	Wait for key release
4132	10 01	DJNZ 01H	32 chrs printed?
4134	C9	RET	Return if yes
4135	18 8D	JR WKEY	
4137	3A 25 40	NOKEY: LD A,(LAST_K)	Addr 4025H
413A	3C	INC A	
413B	20 FA	JR NZ,NOKEY	Loop if key pressed
413D	C9	RET	
413E	3A 00 70	XMTCH: LD A,(7000H)	8251 chip status
4141	1F	RRA	
4142	30 FA	JR NC,XMTCH	Loop if 8251 busy
4144	79	LD A,C	
4145	32 00 60	LD (6000H),A	Send chr to 8251
4148	C9	RET	

4149	Addr of FLG
414A-4188	Addr of Baudot to Sinclair lookup table
4189	Addr of FLG2
418A-41C1	Addr of Sinclair to Baudot lookup table

Fig. 8. Transmit assembly-code listing.

First, peel off the four rubber feet on the bottom of the ZX81 and remove the five screws and the back panel. Remove the circuit-board screws and carefully turn the board over. Gently remove the keyboard cables from their sockets. Refer to Fig. 4 for chip placement, and remove both 2114 ICs or the single 4118 IC. Either memory configuration may be used in the ZX81. I recommend using de-soldering braid, and don't force anything; traces are easily broken. Remove the jumper wire at L1, if it exists.

Now solder a 2016 or 6116 2K × 8 RAM chip at position IC4. Notice that the circuit board has 28 holes in this position; use the *lower* 24 holes. Solder a jumper at L2 to connect address line A10 to the RAM chip, and reassemble the computer.

To check memory operation, type:

PRINT PEEK 16388
+ 256 * PEEK 16389

This should give a result of 18432 if the 2K of RAM is working properly.

The Software

Many of you probably have discovered that the T/S computer has a very slow Basic interpreter due, once again, to the large percentage of computation time required for the display. I designed the RTTY software to be somewhat of a hybrid: part Basic for convenience and part Z80 assembly code for speed.

Figs. 5–8 give listings and flowcharts for the receive and transmit portions of the software, both of which are written in assembly language. For the most part, these routines handle the Baudot-to-Sinclair code conversion and character display during receive, and the keyboard input, character display, and Sinclair-to-Baudot conversion during transmit.

Fig. 9 shows a listing of the assembly-stuffer program. Line 1 saves 199 bytes of space in RAM for the actual code and includes the Baudot-Sinclair and Sinclair-Baudot lookup tables. Line 2 contains all of the assembly code in Figs. 6 and 8 as one long string. Lines 3–7 convert this string into actual hexadecimal numbers, then stuff them into the memory reserved in line 1.

Enter this program exactly as shown in Fig. 9, then RUN it. When the run is complete, LIST the program and check that the decimal numeric sequences have been replaced with jumbled code and that the two lookup tables are still intact. The jumbled listing is the display read-only-memory (ROM) interpretation of the actual assembly code located there. Now DELETE all of the program *except* line 1, CLEAR the variables, and you are ready to enter the Basic part of the software.

The listing of Basic commands is shown in Fig. 10. Lines 10–80 will allow for an unshift-on-space routine in the assembly code for receive by POKEing appropriate commands into locations 40AFH and 40B0H (Fig. 6). If the unshift on space is not selected, NOPs are put into these two locations. Lines 90–100 software reset the 8251 chip, and lines 110–190 are the receive portion of the program. This routine sends the receive command to the 8251, scrolls the screen on each line feed (LF) or when 32 characters have been displayed, and monitors the keyboard for SHIFT T (CHR$ 221) for a jump to the transmit routine located at line 200 and beyond. This por-

```
1 REM 1234567890123456789012345б
78901234567890123456789012345678
90123456789012345678901234567890
12345678901234567890123456789012
34567890123456789012345678901234
56789012345678901234567890123456
7890123456789 E A SIU DRJNFCKTZL
WHYPQOBG MXV  3 - B87 $4",*:(5")
2 60197+ ./;  LODITJM997U7HXGWQR
N5EKPBAS7T1D5HUOAFJMWGSQRE9KBYNX
PLF8
2 LET A$="16000620214941 3A25403C
C03A0070CB4F28F43A0060FE02C8FE1B
2004CBEE18E6FE1F2004CBAE18DEFE04
2002CBAE865FE61728D2194E79D71001
C918C616000620C5ED4B25400C28F90D
CDBD07C14E7921894 1FEC020073E0BD7
1E561832A7200A4ECB71200AD71E5718
313DFE7520147 20E08CD3E410E02CD3E
410E1FCD3E41CD3741C93CFE40D0D7D6
0A5FFE1C500C4ECB790E1BCC3E41CBFE
180A4ECB790E1FC43E41CBBE54194ECD
3E41CD3741100 1C9188D3A25403C20FA
C93A00701F30FA7952000 6 0C9"
3 LET A=16514
4 FOR B=1 TO LEN A$-1 STEP 2
5 POKE A,16*CODE A$(B)+CODE A$(B
+1)-476
6 LET A=A+1
7 NEXT B
8 PRINT "RUN COMPLETE"
```

Fig. 9. Listing of the assembly-stuffer program. When you key in and RUN this program, the transmit and receive assembly code shown in Figs. 6 and 8 will be entered into the computer's memory automatically.

```
1 REM [RTTY Assembly Code & Lookup Tables]
10 PRINT AT 20,0; "UNSHIFT ON SPACE (Y/N)?"
20 INPUT A$
30 IF A$<>"Y" THEN GOTO 70
40 POKE 16559,203
50 POKE 16560,174
60 GOTO 90
70 POKE 16559,0
80 POKE 16560,0
90 POKE 28672,128
100 POKE 28672,64
110 POKE 28672,67
120 IF INKEY$<>"" THEN GOTO 120
130 POKE 28672,4
140 SCROLL
150 PRINT "<<RECEIVE TEXT>>"
160 SCROLL
170 LET A=USR 16514
180 IF INKEY$=CHR$ 221 THEN GOTO 200
190 GOTO 160
200 IF INKEY$<>"" THEN GOTO 200
210 POKE 28672,33
220 SCROLL
230 PRINT "<<TRANSMIT TEXT>>"
240 SCROLL
250 LET A=USR 16576
260 IF INKEY$=CHR$ 219 THEN GOTO 120
270 GOTO 240
```

Fig. 10. Listing of the Basic portion of the program. Line 1 is all that remains of the assembly stuffer, and lines 10–270 control the transmit and receive assembly program code.

tion of the program sends a transmit command to the 8251, scrolls the display, and monitors the keyboard for a SHIFT R (CHR$ 219) for a jump back to receive.

Now key in lines 10–270 and SAVE "RTTY" twice on cassette to ensure at least one good copy.

Assembling and Operating the RTTY Station

Be sure the power is off to the T/S computer before connecting (or disconnecting) the interface box. If you didn't key the connector to the slot in the T/S circuit board, be certain the connector is installed right side up. Connect the cassette recorder and TV monitor to the computer and attach the jumper cables between the interface box and your rig. Turn on the computer and receiver and follow the guidance in the Hardware Construction section (above) if you have RFI trouble.

Now LOAD and RUN the RTTY program. The unshift-on-space routine is a convenience during receive to prevent lockup in the FIGS mode if a LTRS command is missed; the system also will return to LTRS mode upon receiving a space. However, weather broadcasts consist of many strings of numbers separated by spaces, and transmission would be slowed considerably if a new FIGS command had to be sent after each space. Therefore, it would be a good idea to select unshift on space for everything except weather broadcasts.

Set your receiver to the RTTY mode, or adjust the i-f passband, to allow reception of the mark and space tones with minimum attenuation. For amateur reception on the HF bands, select the 170-Hz filter and shift, set 60 wpm, and find a RTTY signal. Your best bet will usually be just below 14100 kHz. Select normal on the NORMAL/REVERSE switches and advance the input-level pot while tuning around the RTTY station until the LEDs illuminate.

Now tune the receiver until the LEDs follow the high and low tones and, if all is well, text should appear on the screen. The system will scroll when a displayed line is full or when a line feed is received. In order to familiarize yourself with operation of the LEDs you may want to tune around an unmodulated carrier or CW signal. As the tone increases in frequency, you'll notice the L LED come on, shift to the H LED, and then both LEDs will extinguish as the tone frequency exceeds the filter/decoder passband.

To receive commercial or VHF amateur RTTY, select the 850-Hz filter and shift and tune in the same manner as above. Since the audio shift is wider here, the tuning will be slightly less critical than in the 170-Hz case. Commercial news broadcasts are usually at 67 wpm and NORMAL, weather is 100 wpm and NORMAL, and some ship-to-shore is 100 wpm, 170 Hz, and REVERSE. Many of the commercial broadcasts seem to be between 16.0 and 16.5 MHz. If you happen to run

HEX	DEC	LTRS	FIGS	T/S FIGS Print	T/S FIGS Keyboard
00	00	BLANK	BLANK	none	none
01	01	E	3	3	3
02	02	L/F	L/F	SCROLL	ENTER
03	03	A	-	-	-
04	04	SPACE	SPACE	SPACE	SPACE
05	05	S	BELL	B	< or >
06	06	I	8	8	8
07	07	U	7	7	7
08	08	C/R	C/R	none	ENTER
09	09	D	$	$	$
0A	10	R	4	4	4
0B	11	J	'	"	""""
0C	12	N	,	,	,
0D	13	F	!	*	*
0E	14	C	:	:	:
0F	15	K	(	(	(
10	16	T	5	5	5
11	17	Z	"	"	"
12	18	L	)	)	)
13	19	W	2	2	2
14	20	H	#	£	£
15	21	Y	6	6	6
16	22	P	0	0	0
17	23	Q	1	1	1
18	24	O	9	9	9
19	25	B	?	?	?
1A	26	G	&	+	+
1B	27	FIGS	FIGS	none	none
1C	28	M	.	.	.
1D	29	X	/	/	/
1E	30	V	;	;	;
1F	31	LTRS	LTRS	none	none

Fig. 11. Listing of the Baudot code with appropriate decimal and hexadecimal equivalents. The special Timex/Sinclair FIGS codes for the display and keyboard are shown in the last two columns.

across a non-Baudot station or if you select the wrong system parameters, garbage will print on the screen.

To transmit, simply hit SHIFT T, and if you wired the jumper correctly, your rig should switch to transmit. Adjust the output level and mike-gain controls for a reasonable rf output power. Don't overdo it—my TR7 gets plenty hot with only 60 W continuous output power. RTTY isn't like CW; the rig is putting out full power continuously during transmit, and most manufacturers recommend cooling fans for their solid-state gear when running high power in this mode.

Adjust the monitor-level control until the 2125-Hz tone is audible, then type your message. You should hear the space tones intermittently as you type. You can keep your eyes on the keyboard and simply listen for confirmation of character transmission. The 8251 chip gives you a single character buffer (big deal) so you can type a new character while the previous one is being sent.

Note that the computer automatically will send LTRS and FIGS codes where necessary and also will send a CR/LF/LTRS command when you hit the ENTER key, or on the first space after 64 characters are sent with no intervening ENTER. Your transmission is thus automatically keyed to the 80-column printer found on most mechanical and high-priced electronic systems. Also notice that the SPACE key really produces a space; if you want this key to act as a program BREAK, press the key while in the receive mode. In this way, you can return to the T/S operating system. Typing SHIFT R while in the transmit mode returns the system to receive.

Some Baudot FIGS characters are not present on the T/S keyboard for transmission or in the character set for display. The most logical substitute characters I could think of are listed, along with the Baudot character code, in Fig. 11.

Conclusion

Many amateurs feel that frequency-shift RTTY is the ideal communication mode, and with good reason. It has a 3-dB signal-to-noise advantage over machine-decoded CW signals, and information is sent much faster than most manually-decoded CW. In many cases, when an HF band is nearly useless for CW or voice communications, the RTTYers are still going strong. Indeed, I can get about 90% copy with my system tuned to a signal which is weak and barely audible. There is also much satisfaction to be gained in the construction of a project of this nature, allowing you to experiment with a very useful specialized communication mode at minimal cost.■

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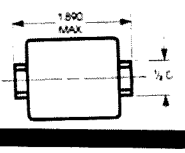
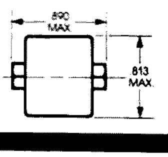
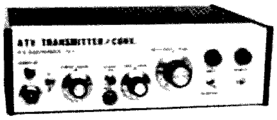
9. Lord, M., *The Explorers Guide to the ZX81*, Edition 2, Timedata Ltd., 1982.



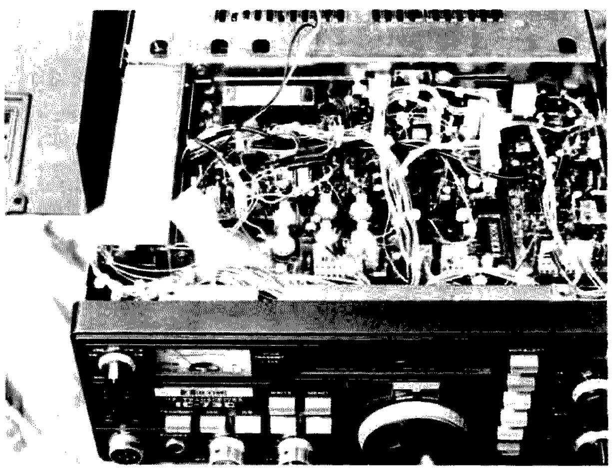




Easy FSK for the IC-730

Don't settle for less than complete.
Four dollars gives you the RTTY the factory left out.

The IC-730.



Top view: The wires for my modification are identified with white tape, here shown going to the pad 1 and pad 2 locations under the calibrate pot on the main board.

Emory D. Young WA4TTO
2403 E. Bolling St.
Savannah GA 31404

Having recently acquired Icom's IC-730, I noticed that it didn't have a RTTY mode. As I wanted to get into RTTY, I had two choices: to build up an AFSK unit or to modify. Being naturally curious, I decided to modify, if possible, and pulled out the schematic.

The PLL has a 13.66-MHz crystal and is calibrated with a 10k pot (R-162) that controls the bias on a varicap diode. By switching a resistance in parallel with the calibrate pot, you can change the frequency of the 13.66-MHz crystal oscillator and the frequency of the rig. See Fig. 1.

First remove the top and bottom covers. In order to gain access to the foil side of the main unit board, you have to remove the 17 plugs that are plugged into the main unit board. Unscrew the four mounting screws. (*Note*: The mounting screws are permanently locked to the main board.)

The coax cable from J14 has to be slid in the wiring harness toward the detector unit in order to have enough slack to turn the main unit board over.

Cut two 15-inch pieces of wire (about 22 gauge) and, referring to Fig. 2, solder one wire to pad 1 and the other wire to pad 2. Be sure to re-

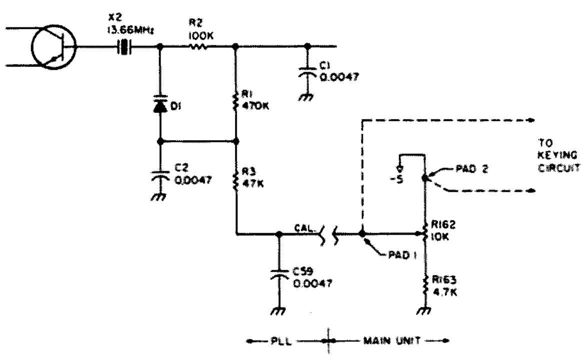


Fig. 1. Schematic.

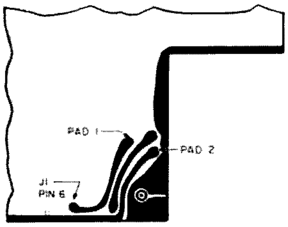


Fig. 2. Foil side of main unit board.

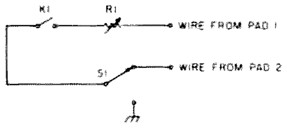
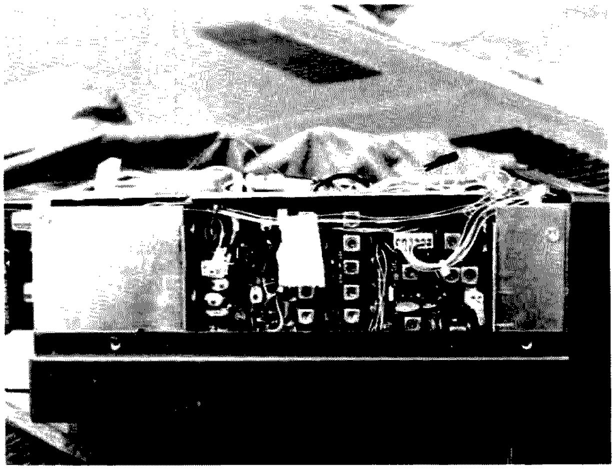


Fig. 3. Keying circuit with shift switch.


Right-side view showing routing of modification wires to the rear and then straight to molex connector.

member which wire is which, as this is very important. Carefully replace the main unit board and plug the wiring harness back in.

If you don't have the optional marker unit, J15 will be empty, so don't search for the missing plug, as I did.

Remove the 8 screws at each end of the rear panel and unplug the coax cables from J1 and J3 on the low-pass filter board. Run the two wires you soldered back to the accessory socket where you have 13 unused positions just begging to be used. Make up a couple of molex® pins or, if you don't foresee any use for existing accessory connections, cut wire from two of the positions and attach your wires to them. Pin 8 of the existing socket is ground. This done, plug coax cables back in, reassemble the rig, and put the covers back on.

Referring to Fig. 3, K1 is a reed relay and R1 is a 50k pot. S1 is an optional SPDT switch used to select Mark low or Space low. Keying between pad 1 and ground makes Mark low, and keying between pad 1 and pad 2 makes Space low. Adjust R1 for desired shift. Going from Mark low to Space low or vice-versa will require readjustment of R1.

When transmitting, use the AM mode instead of the CW mode, as the 40 Watts in AM are easier on the finals and they can operate for extended periods this way.

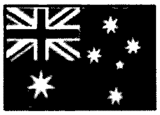
I will gladly answer or correspond about any questions you may have if you enclose an SASE. K1 and R1 are stock items at Radio Shack. Molex connectors with their pins also are available at Radio Shack.

So get into RTTY with your IC-730 and this very low-cost modification. It should not cost over $4.00 with all brand-new parts. See you on the bands. ■

73 INTERNATIONAL

Each month, 73 brings you ham-radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Perry Donham KK2Y.*



AUSTRALIA

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Australia

NEW VK CALLSIGNS

The Department of Communications (DOC) has just released a new block of callsigns for the amateurs in Australia. It is getting as bad as the States, trying to keep up with the suffixes when each means something different. The new suffixes, and what they mean, are as listed below (the space is where the Australian state indicator goes):

Full amateur—VK-FAA to FZZ
Limited amateur—VK-TAA to TSZ
—VK-TUA to TZZ
Novice operator—VK-MAA to MZZ
Combined Limited
and Novice—VK-JAA to JZZ

RECIPROCAL LICENSES

I recently had reason, due to a feedback letter from the States, to check with the DOC on what is required by overseas amateurs when applying for a reciprocal license in Australia.

The main complaint in the letter received was about a clerical error—the wrong form being sent to this gentleman—but some of the points raised by him are worth explaining here, to keep this problem from happening again.

The first thing you must do is to explain fully that you require a reciprocal amateur license to operate in Australia, making sure you state the period you wish to operate. The form to ask for is "RB57 Application Radiocommunication Licence," and you need only to fill in questions No. 4—Name of Applicant, No. 5—Postal Address, and the declaration on the bottom. That's all; forget the rest as this is a multipurpose form. Make sure you apply at least four months prior to leaving for Australia.

After filling in this form, return it with a certified copy of your license, together with Australian $20.00 [about US$21.30—check with your bank] plus a large self-addressed envelope. We know that amateur licenses in the States are free, but we have to pay, at present, A$19.00 per year, and as a reciprocal license is good for a period of one year (whether you stay a year or less), it also costs that. There were questions asked of our DOC by the WIA regarding short-term licenses for overseas amateurs, but it was found that a 3-month license could be even dearer due to administrative costs. At the present time it costs A$1.00 to airmail a large 4½" × 8½" envelope to the States.

The preferred method of payment is by bank check, remembering the difference in currency value plus bank clearance charges. As you are dealing with a government department and not an individual, ten cents over is a lot better than ten cents under when sending over your check! (The right money is preferred.) (Stateside Novice license holders are not able to gain a reciprocal license with Australia.)

Our DOC has a policy of giving all possible aid to overseas amateurs wanting reciprocal licenses, but being a government department, they must abide by government policy.

The preferred method of granting licenses to overseas amateurs is for you to present your current amateur license (or certified copy) at any branch of our capital cities' licensing departments and your VK reciprocal license will be handed over the counter to you with only a five-minute delay.

Another way to go is to get one of your VK on-air friends to get it for you, if he lives near one of our major cities. I am told by the DOC that they will issue one to him for you, providing all the paperwork is correct.

I know that the last thing you want to do is chase after a license when on holiday, but providing it is not the weekend or a local public holiday, the appropriate department will be open during normal working hours and will be only too pleased to issue a reciprocal license over the counter.

There is a good case for an International Amateur License, but with all the different grades plus ever-changing licensing criteria throughout the world, what an administrative headache this would present! I feel that we amateurs would have to pay, in the end, one way or the other, for this privilege.

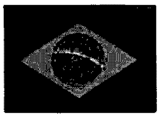
VK9L—LORD HOWE ISLAND

There have been many requests to our DOC over the years to correct the anomaly that existed with the Lord Howe island callsign, as it had separate country status but still retained the VK2 callsign. You can imagine that this did cause some confusion to overseas stations, unless the station operating signed "Lord Howe Island."

This has now been remedied by our DOC issuing a new block of call letters, VK9LA to VK9LZ. This should make it easier for overseas stations to recognize this call in the future.

The "Down Under DXers' Club" operated last year from Lord Howe Island as VK2LHI with great success. They have stated that they will try to activate this DX spot on a regular basis, at least twice a year during contest operations. As a result, this one should finish very low on the DX Most Wanted List in the near future.

Dick VK2AGT, a permanent resident on Lord Howe Island, is now VK9LH, while the new call for Ken VK2BKE, the other permanent amateur resident, is unknown to me as yet. Ken is well known as a Morse-code instructor for the VK2 division and often takes the on-air slow Morse sessions for this division on 3.550 plus or minus QRM at 09.30 UTC.



BRAZIL

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20270 Rio de Janeiro, RJ
Brazil

MARCONI OR LANDELL DE MOURA?

Guglielmo Marconi is known all around the world as the first man who made a wireless transmission—it happened in 1898. Meanwhile, three years before, in 1893, Roberto Landell de Moura, a Brazilian priest father and a researcher of electrical phenomena, succeeded in transmitting wireless phone signals for about eight kilometers in the city of Sao Paulo. It took him a lot of studying and experimenting without any help and using only poor apparatus he had at home.

Due to his humility, this event was not spread out for the world that time, and it is still unknown except for us Brazilian operators for whom he represents the beginning. You may be sure that it was a Brazilian before Marconi.

CELSO BUSS PY3CB

With deep regret we record the passing of Celso Buss PY3CB (ex PY3APH), one of the most well-known DXers of Brazil. Very young, 44 years old, Celso achieved many awards (one of the first in Brazil to get the Five Bands DXCC, DXCC Honor Roll, etc.), and, above all, was a very kind and charming person.

CECW AWARD

Sponsored by the CW group of the state of Ceara, the CECW award is available to all licensed amateurs for confirmed contacts with five PT7 stations. Among them, three must be CECW members. Contacts must have been made after September 1, 1983, on any amateur band. Only two-way CW mode. No QSLs. Send GCR list of stations worked (call, date, time, band, mode, and report) and 10 IRCs for mailing expenses, to CECW Award, PO Box 546, 60000 Fortaleza, CE, Brazil.

CECW members: PT7s AA, AC, ADC, AI, BTO, CG, EQ, HP, NK, ON, QR, WA, XO, YS, ZD, ZP, and ZZ.

de PY1APS

BRAZILIAN LEAGUE AWARDS

Brazilian Radioamateurs League (LABRE) sponsors four very interesting not-so-easy-to-get awards, encouraging interest in Brazilian areas, American areas, and Atlantic Ocean areas. You can judge yourself and join the fun of them all!

The *WAB (Worked All Brazil) Award*—available to amateurs confirming QSOs with Brazilian stations in all states and Brasilia City, PT2. Special ribbon to confirmed QSOs with Federal Territories of Amapa, PY8 (ex PU8), and Roraima, PV8.

The *WAO (Worked Atlantic Ocean) Award*—available to amateurs confirming QSOs with all 9 Brazilian geographic regions and 21 countries of the Atlantic Ocean. *First Region*: PY1/PP1, *Second Region*: PY2/PP2/PT2, *Third Region*: PY3, *Fourth Region*: PY4, *Fifth Region*: PY5/PP5, *Sixth Region*: PY8/PP6, *Seventh Region*: PY7/PP7/PR7/PS7/PT7, *Eighth Region*: PY8/PP8/PR8/PS8/PT8/PV8/PW8, and *Ninth Region*: PY9/PT9/PY0.

The *WAA (Worked All America) Award*—available to amateurs confirming 45 (forty-five) countries in the American geographic area; one of them must be Brazil.

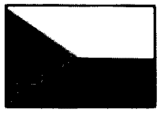
The *DBDX (Brazilian DX Award)*—available to amateurs confirming QSOs with a minimum of 20 (twenty) different countries on the official DXCC list; one of them must be Brazil. Contacts must be on 160, 80, or 40 meters.

Special stickers allowed for additional countries in groups of 10. There are three kinds of certificates: only phone mode, only CW mode, and mixed (phone/CW operation).

All stations must be contacted from the same country. (Only exception when a station moves to another call area or country within a radius of 150 miles from initial location.) Only land stations accepted; no air or maritime mobile accepted.

Contacts are valid over any period of years, with same station license even if with different call letters. Logs with all data as in QSLs, checked by applicant's Award Manager or by two licensed amateurs. All applications must be sent, enclosing 10 IRCs for handling and postage, to LABRE Awards Manager, PO Box 07-0004, 70000 Brasilia, DF, Brazil.

Note: Since March, 1984, PU prefixes identify class-C operators in Brazil, and the PU8 call for Amapa Territory has now changed to PY8. Only PU8 GAA to IZZ calls identify new class-C operators from Amapa. Before then, Amapa's QSLs are considered valid PU8 calls for LABRE's award.



CZECHOSLOVAKIA

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Czechoslovakia

AO-10 IN CZECHOSLOVAKIA

At the beginning of January, 1984, after an operating pause devoted among other things also to the improvement of sets, Ondrej OK3AU resumed his satellite operation which he certainly did not regret being able to do. The number of nice DX contacts with FK8CR, KH6IBA, VK3ZL, W1BIH/PJ2, JR6UPU (Okinawa), VS6HI, and FR7CC was increased in his log. An interesting additional station was LA2PH/MM, with Ken, who had sailed his ship M/T *Thorsholm* for A8X (The United Arab Emirates) and during his contact he found himself not far from C9 (Mozambique). In the second half of January, the expedition LU2A from the South Orkneys was working under the callsign AZ5ZA (SSB). Ondrej also heard the following (operating SSB): VP8NO, JY1, TI2NA, TU2IT, 4U1ITU, EA8JJ, Z25JE, and HL9FZ. The biggest DX was the reception of ZL2 (New Zealand) that is at the very boundary of the communication range AO-10. At the end of January, Ondrej had added up 52 DXCC countries from all six continents.

At AO-10/B another Czechoslovak station appeared, at last. It was Mirek OK1DMS from Marianske Lazne.

* * * * *

New records and new countries in the VHF and UHF band:

• A full use of extraordinary conditions created by a sporadic E layer in June and July last year was made by Jenda OK2BFH, who made contact with more Spanish stations, but also with 9H1CD, CT1AUW (his new country) and especially with EA8XS on the Canary Islands. EA8XS represents not only a new country for OK-land and OK2BFH personally, but also a new Czechoslovak record in the category of propagation by means of a sporadic E layer, 3757 kms, on 16 July 1983.

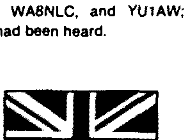
Jenda was also successful with Perseides contacts; in August, 1983, he had advance non-agreed contacts with SM2ILF, SM3JAW, SM3KJO, and agreed contacts with LA6CU and UA1MC, the last one enduring for 20 minutes with the intensity S9 for up to 3.5 minutes at a time.

• OK1AIY successfully made full use of a license for the 1296-MHz band obtained since 1 July 1983, and as our first station he made contact on the above-mentioned band on 13 September 1983 with Y23FL/P in the German Democratic Republic. Y23FL/P, who is in locator HK14c, made use of a 10-mW and a 15-element yagi. Pavel had a 4 × 15-element loop yagi, 20 Watts, in locator HK28c.

• OK1KHI certainly cannot complain of tropospheric conditions in the second half of October last year. On the 22nd and 23rd the station made 375 contacts from Snezka ranging from EI (Ireland) to UA3 (European USSR) on the 145-MHz band, 78 contacts on the 433-MHz band, the first contact from OK-land with GI4GVS, GU6EFB, and EI6AS—the last one 1525 kms away. Twenty-seven contacts were on the 1296-MHz band, the longest one with G4CWB at a distance of 1257 kms.

• OK1CA had bad luck because he arrived at Snezka on October 26th, but in spite of that he made 16 contacts on the 1296-MHz band, the longest one, 1089 kms, being with G3LTF. On the other hand, on October 28, 1958, he had good luck meeting OK1VR in Snezka who came 25 years earlier after he had broken a long-lasting Czechoslovak record of 1518 kms on the 145-MHz band by contact with GI3GXP.

• Radio club OK1KIR was very successful in the first part of the EME contest that took place on October 29 and 30, 1983. Operators had been working on the 433-MHz band with JA6CZD, OE5JFL, DL9KR, HB9SV, G4EZN, YU1AW, OH6NU, N4GJV, HB9G, W0RRY/5, N9AG, G3LTF, OE9XXI, SM3AKW, K2UYH, I5MSH, DK8MA/P, and on the 1296-MHz band with OE9XXI, K2UYH, OE5JFL, G3LTF, W7GBI, LX1DG, DF0EME, WA8NLC, and YU1AW; even ZL3AAD had been heard.



GREAT BRITAIN

Jeff Maynard G4EJA
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Widnes WA8 9RP
Cheshire
England

THE UK SCENE

Most of you probably know that UK amateurs are not allowed to handle third-party traffic. Until recently, the only chink in the authority's armor of anti-third-party traffic handling was in provisions for emergency message origination. Even to do this, though, requires a typically British bureaucratic procedure. An amateur may pass emergency or life-saving traffic only at the request of a designated official.

In theory, then, a public-spirited amateur equipped with, say, 2-meter mobile gear and coming across a serious traffic accident cannot legally request another amateur to QSP a message to the emergency services. In practice, of course, any self-respecting amateur would do everything he could to alleviate the situation he found, and normally the authorities would turn a blind eye (wouldn't they look silly prosecuting in such a case?).

Anyway, there are now some further signs that the days of restrictions on third-party traffic may perhaps be numbered. Non-amateurs may use a licensed station under supervision to pass greeting messages, but only to another station within the UK. The other station may be similarly manned. This provision is aimed at events such as the Jamboree On The Air (JOTA) which is always a popular and well-supported event in the UK. In the 1983 JOTA, some 13,000 Scouts and Guides (Girl Scouts) took part worldwide including no fewer than 455 UK stations.

JOTA contacts from the UK were made with some 50 other countries on HF and via OSCAR 10. There can be no better introduction for youngsters to amateur radio than via their scouting activities. This has been the case for many years but now the Scouts and Guides have the opportunity to use the microphone themselves, albeit for only limited greetings messages.

The Scout headquarters' JOTA station, GB2GP, was officially opened by the chairman of local Epping Forest District Council, who used the greetings message facility to swop felicitations with another civic dignitary, the mayor of Northampton, who opened another JOTA station, GB2NDS, at the same time.

There can be little doubt that being involved in an amateur-radio transmission is far more likely to promote a spark of interest than just watching somebody else. When this interest comes from an elected local representative, the whole amateur movement stands to benefit. Amateur radio is often misunderstood, misquoted, or confused with CB, or just dismissed as boys playing with radios. Any opportunity to demonstrate the finer points of the hobby to others should not be missed.

I was recently the after-dinner speaker guest for a local Round Table (known as Active 20/30 in the US) and I chose to talk about the Amateur Radio Service with the emphasis on service. It never ceases to amaze me how little most people understand of the technology associated with radio and of the part played by amateurs. A demonstration of handie-talkies, pocket-sized HF receivers, OSCARs, and pictures of the space shuttle tends to bring a few glazed looks from the audience but they never again dismiss hams as cranks.

When giving such talks I try to keep away from too much in the way of technicalities and jargon and tend to concentrate on shortwave listening. This is for two reasons—first, it is easier for the uninitiated to follow, and second, it is something the man-in-the-street can easily take up for himself with little outlay and no technical knowledge. How many times, though, do you see demonstration stations at fairs, festivals, and the like, working stations lost in the noise and using nothing but Q-code jargon? We all like to work DX, but when trying to interest the public, a little clarity and plain English will go a long way.

I was in Italy on holiday during World Radio Amateur Day in April. I thought it would be a good idea to take a handie-talkie just to listen to the local 2m traffic (I had no time to apply for a reciprocal license so was not intending to transmit). Despite protests from the XYL about the extra weight, the IC-2E went into the case with a freshly-charged battery pack. When I first decided to use it, 2 days into the trip, I found I had left it switched on! There is a moral to this story, but you must have guessed it by now!

SV1PL inside...

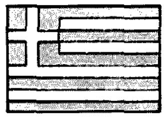
My little vest-pocket stereo FM radio from Toshiba does not cover 2 meters, of course, but the number of band-2 stations around Naples is almost as many as around LA. At least there is the US forces network on 104 MHz which has excellent coverage of the Naples Bay area and is in English (my Italian is rather limited)!

A few days ago I visited Communications 84, the biennial trade exhibition and conference at the National Exhibition Center near Birmingham. It is primarily a showcase for manufacturers of commercial telecommunications gear including switchboards, modems, multiplexers, and so on. This year two particular themes seemed to dominate.

First, a rash of products was aimed at catching the eye of the consumer recently freed to buy his telephone anywhere. Until last year all (legal) telephones and extensions had to be rented from British Telecom. Now, with liberalization, the consumer can buy additional approved instruments from whomever. Needless to say, the UK market is now flooded with telephones from just about everywhere and in just about every shape. (The Mickey Mouse phone I brought back from the US a few years ago has lost its conversational appeal all of a sudden!)

Second, the personal-computer market continues to believe that nobody can survive without communications. Every respectable PC has at least one modem and a local-area-network connection for bulletin boarding or electronic mail. (Or at least that's what the salesmen would have us think.)

Also at the show were a number of exhibitors of specialized or military hardware. They were showing ruggedized HF receivers, backpack radios, Morse decoders, and the like. In every case their demonstrations were tuned to amateur broadcasts. It was most encouraging to see a crowd of professional communicators around a stand watching a CW QSO displayed on a screen.



GREECE

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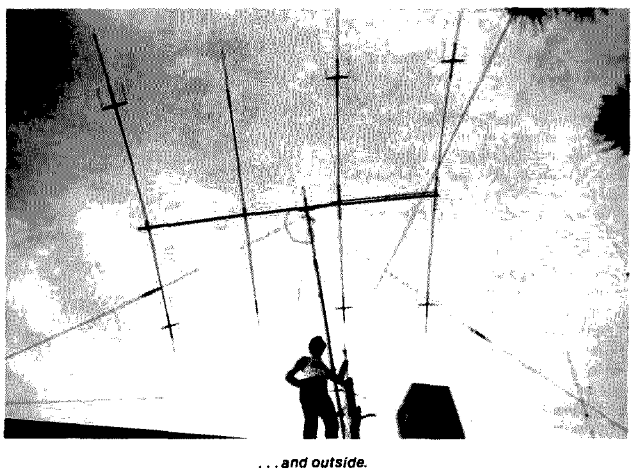
Greece

Continuing the presentation of some SV DXers, this month we have Angelo SV1PL.

But before that, I would like to point out something which I thought of just a few hours after last month's column was traveling to 73 headquarters. What I was trying to say is that HF is not the only place where DXing is taking place. With the tremendous range of AMSAT's new bird, two meters offers a lot of DX now. Besides



...and outside.

that, working with sporadic E openings or meteor scatter or even tropo and aurora can give DX contacts which are equally worth the ones on the HF bands. Therefore I will be more than happy also to present through this column a number of people working above 50 MHz.

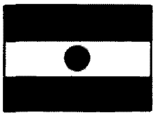
Back to Angelo, now. SV1PL is situated in Marousi in the northeast part of Athens city. Angelo, who is now 34 years old, got his ticket some three years ago, and from the first he was attracted by the HF challenge. Starting with a Kenwood TS-130, he played around for some time with dipoles, verticals, and the like, but after understanding it was a waste of time, he moved to a Hidake three-element beam.

Anyway, he was learning quite fast and after his first year of amateur life, he started to take part in contests and to collect diplomas.

Today, SV1PL has 245 confirmed SSB DXCC contacts and is looking for more. His station consists of the same TS-130, an RF Power Electronics antenna tuner, and an HB443DX-4 four-element, four-band beam antenna from TET. On the low bands Angelo is using an HF5 from Butternut. On the other bands he has the FT-480R and FT-780R from Yaesu (very popular in Greece) for 2m and 70cm respectively. The antennas for those rigs are a 16-element and 19-element F9FT, both of them horizontally polarized.

Finally, there is also a TRS-80 Model I Level II computer equipped with Macrotronics interface and software for RTTY and CW and many other amateur-related programs.

So if you hear SV1PL on the air, do not hesitate to call him; even if you greet him in Spanish or French, he will answer back.



INDIA

Major T. A. Ramakrishnan VU2TN
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India

GOODNESS IS GRACE!

Whenever you listen to the activity on the 20-meter band, especially around 1530 or so, you will find a regular activity on the DX horizon from India, on 14150 kHz. If you listen carefully and if the few hundred "Ullannas" permit you to listen, you will hear a net in progress. Most of the days, this net would be conducted by a YL. The YL whose voice you will hear is Grace VU2AIG.

Grace and her OM, Dasan VU2AID, are devoted hams in India. They operate from Bombay, and to them hamming is a very important part of their life. Not just working DX or chasing the rare ones, but in being part of the national emergency network, the Airnet-India, which, incidentally, has its own callsign, VU2NET.

With Julia, their only daughter, away at Patna practicing as a doctor, being also a ham (VU2AIJ), this family is a total ham family, with a great determination to carry on the great work of rendering relief to the needy through ham radio.

With only about two years' "driving license" at the mike, you will find Grace a really wonderful person to meet, both on the air and in person. Ever helpful, Grace is goodness itself and goes to any amount of personal troubles to help out the many patients in VU-land who need medicines which are just not available in that country and have to be brought in from outside. Incidentally, the Airnet-India has this unique service offered to the country; there are at least a few hundred families around India who are grateful to Grace for saving the lives of their near and dear.

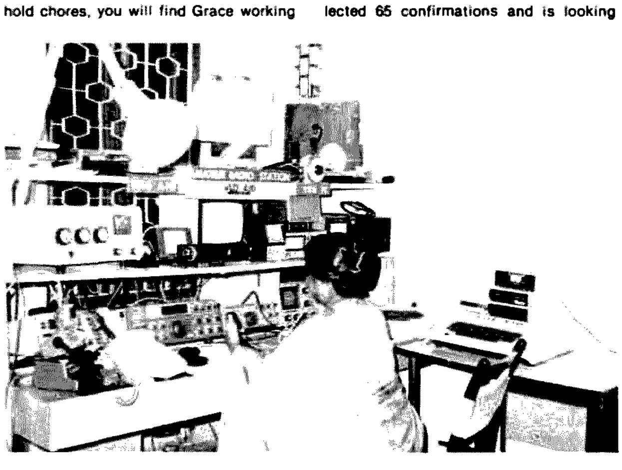
Grace VU2AIG outside...

It works like this—after the net is called, any ham who has a need for medical assistance lists the medicine needed, its source, and the country of origin. Grace then contacts the few sources in DX either by landline or by other means and passes on the requirements to the most likely source. The medicines are procured and put on the next flight to Bombay, and either Grace or OM Dasan collects the same (sometimes even at midnight) and arranges to put the medicines on board the next internal flight. The medicines are collected by the Mr. Needy Ham, who is informed on the air, again through the Airnet-India. Thanks to the wonderful cooperation of the Air India and the Indian Airlines, lives dear to someone are saved.

When she is not busy with her household chores, you will find Grace working DX mostly on the 21- and 28-meter bands. I will bet that you receive her QSLs faster than you post yours, since she QSLs all contacts direct and feels that QSL bureaus are very tardy—so, in case you do want a QSL from Grace, better do it direct!

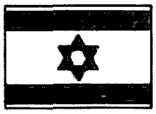
To keep her active, she has a wonderful shack—HF is covered by a TS-930S, TR-7, TS-430S, and a veritable antenna farm with a three-element beam, a two-element quad, a Butternut vertical, and a number of dipoles which help put a really FB signal out of Bombay. VHF is catered to by a whole lot of equipment with exotic antennas. The shack has minor details like an Apple II computer, a Robot terminal, a word processor, and all the monitoring equipment which would make the shack look like an Indian branch of Radio Shack, indeed!

Unlike many ham families, OM Dasan is a home-brew fiend and thus Grace has all the time to be on the bands. She would like to get her DXCC and has already collected 65 confirmations and is looking forward to the balance. So, in case you have contacted her, do send in your QSL!



...and inside.

While not on the air, Grace, an accomplished pianist, loves to play Chopin and Tchaikovsky. She is also a qualified teacher and thus has endless patience in listening to endless monologues. But most of all, as I said, she loves to help any friend, any ham; thus, as the title reads, goodness is Grace!



ISRAEL

Ron Gang 4Z4MK
Kibbutz Urim
Negev Mobile Post Office 85530
Israel

THE NEW BANDS IN ISRAEL

In late 1982 the Israeli government ratified the 1979 World Administrative Radio Conference allocations for the new amateur bands. Nearly a year and a half has passed since then, when your faithful reporter made the necessary changes to activate his rig on these bands, loaded his longwire, and gave them a try. The following is a combination of official information, personal experience, and details gleaned from other amateurs.

10 MHz

This is by far the most promising and active of the new bands. As with 24 and 18 MHz, the Class A amateur is allowed 150 Watts peak input while the Class B licensee is limited to 100 Watts. The Class A hams may use 10.100 to 10.150, but the Class B holder is restricted to 10.110 to 10.130 MHz. Both SSB and CW are permitted, not only across the entire band but on 24, 18, and 1.8 MHz as well. Operation must be on a secondary non-interfering basis to the other services that populate this band. There are no further limitations.

You may have raised an eyebrow upon reading that SSB is permitted. The International Amateur Radio Union (IARU) had recommended that only CW be used on this narrow slice of spectrum and indeed most countries permit only Morse operation here.

One Saturday, as our national 40-meter net ended, I suggested that we make a test and requested that everyone with capabilities move up to 30 meters. A dozen stations responded using a variety of rigs and improvised antennas, and we were in the midst of an SSB round table exchanging signal reports and comparing stations. A European station was heard in the background on CW sending "NO SSB," and Vic 4X6GP broke in asking indeed what we were all doing here on SSB. Of course, this was only a test, the band was not crowded, and we were all complying with the terms of our licenses, so Vic was reassured that 10 MHz was not going to be overrun by SSB operations. As it turned out, signals were much better on 40 meters, so we were convinced that this was not the optimum band for local QSOs.

With regard to SSB operation on 10 MHz, Vic told me that during his operations here he had heard only French stations on phone.

How about propagation on 30 meters? An oversimplification is that 10 MHz behaves partly like 20 meters and partly like 40. Actually, skip on this band seems to have a character of its own, but then the fact that most stations here are using low power and unity-gain antennas probably has a bearing on the "feel" of 10 MHz. In a year or so of casual operating, putting out

a hundred Watts of CW into a longwire somewhat directional to Europe and North America, I worked all continents from JA, VK, and ZS to VE and YV with Europeans being commonplace. Vic 4X6GP and Dov 4Z4DX have had similar experiences.

The beauty of 10 MHz is that with the lower maximum usable frequency accompanying the decline in the sunspot cycle, especially in the winter months when 20 meters is as dead as a doornail, one may still hear DX stations coming through. On one such winter night with the higher bands dead and 40 meters choked with European signals and commercial QRM, I could hear both US and Japanese signals, albeit weak, coming through.

On this side, 30 meters is quite full of commercial stations, most on RTTY, no doubt running considerable power as they really push around the S-meter, while at the same time one may have to crank open the gain in order to read amateur signals. My observations are that there are a few "windows" free of commercial QRM and thus useful to amateurs. They are 10.100 to 10.108, 10.120 to 10.126, 10.130 to 10.133 and 10.142 to 10.150. Look for the DK9WCY beacon on 10.144 to check band conditions. At no time here have I experienced overcrowding, in spite of a few kilohertz actually free.

Some of my contacts on 10 MHz have said that 30 meters is what ham radio used to be like. Digging down in the dark depths of my memory, I must agree. Most stations are using low power, simple antennas, and are good CW operators and gentlemen. There is no overcrowding or bad manners. All this has given me the feeling that a lot of the operators here are experienced hams, refugees from what has become routine on the other bands, who are nostalgically looking to capture the spirit of the "good old days."

So far, the voluntary ban on competition on the WARC bands requested by the IARU has been instrumental in preserving the unique character of 10 MHz. Indeed, it was a wise move to keep the band free from contests and certificate-hunting so that the band could be enjoyed for its own qualities alone.

18 and 24 MHz

After the new bands became available, I fired up on 18 and 24 MHz as well, and to the best of my knowledge was the first Israeli to appear on these bands. I'd call CQ, attract a pileup of Europeans, and work everyone calling until I'd dried up the band, as it were. Many of the stations worked were encountered on the other WARC bands, apparently enjoying the novelty of the situation, as was I.

Although I didn't become a frequent user of those two bands, I did notice a gradual dropping off of activity. It got to a point that in spite of good propagation and crowding on the adjacent 21- and 28-MHz "old" bands, these new ones would seem almost dead with occasionally someone putting out a CQ call for ten minutes or more until enticing a reply or giving up. Thus I gradually lost interest in 16 and 24 MHz until I had all but forgotten them.

One day in mid-April this year, Adi 4Z4VG told me that a day previously he had worked VK6RO on 24 MHz. This was probably the first Israel-Australia QSO ever on this band. As they had arranged a sked for the next day, I checked to see that the longwire would still load and immediately worked F9VK on SSB. He was followed by Tom GW3AHN on CW, who told me that using only a dipole he'd already worked 50 countries on this band. VK6RO did show up for his sked, and he was able to read me on CW but not on SSB.

Some countries have imposed tough restrictions on the use of 18 and 24 MHz. Amateurs in the United Kingdom are limited to ten Watts only and are not allowed gain antennas, so they must stick to dipoles or quarter-wavelength verticals.

Here in Israel, power limitations are the same as on 10 MHz. Class A amateurs may use from 18.068 to 18.168 and 24.890 to 24.990 megahertz while B licensees are restricted to 18.109 to 18.130 and 24.910 to 24.950.

It would seem that these two bands are just barely beginning to be explored. No doubt they have great potential; there are few commercial stations in these segments and worldwide propagation is possible, depending on the season.

1.8 MHz (160 Meters)

Although not a new band for most countries, 1.8 MHz was opened in Israel along with the WARC bands. Grade A licensees may use up to 100 Watts input, 1.810 to 1.850, and ten Watts from 1.850 to 2.000 MHz. The class B boys are sadly limited to 10 Watts from 1.810 to 1.850 alone. More details about the "top band" may be found in my column on Riki 4X4NJ's activities here, in the February, 1984, issue of *73*.

At Riki's prompting, in mid-March I finally put up a proper antenna for 160. I chose W1BB's inverted L that I saw in the Canadian *Top Band News* published by Ivan VE3INQ. This simple yet effective antenna certainly proved itself during a band opening when I worked 25 east-coast US stations, "crossing the pond" for the first time on 160.

Dov 4Z4DX did some serious work here in the last season, and along with Riki and myself, we hope that Israeli stations will become less of a rarity on the top band. Antennas are without doubt the biggest obstacle to getting out on 160; however, in the last issue of *HaGal*, the Israel Amateur Radio Club bulletin, Riki has just had published plans for the inverted-L antenna that I just spoke of. Interest here is rising.

When asked what are the advantages of this band, I reply, "Absolutely none!" No doubt this is what makes 160 meters so attractive—the difficulty and the challenge. Today there is not too much required to get a signal around the world on the higher bands, but to span the globe on one-sixty is no mean feat!

These paragraphs sum up the present state of the new bands as experienced here in Israel. As elsewhere, there is only a small percentage of the hams active on these frequencies. These are indeed some of amateur radio's newest frontiers, and there is a lot of exploring to be done.

It would indeed be interesting to read here in the *73* International column the state of the new bands in other countries. This no doubt would provide useful information for those charting out the propagation in these newly available segments of the spectrum.

ITALY

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IARU CONFERENCE AT CEFALU

The IARU Region 1 conference is over and it is now time to have a small inventory of what has happened. The opening speech was made by PA9LOU, chairman of the conference, with thanks to the Italian Ministry of Telecom and welcomes to Mr. R. Baldwin, IARU president, A. Shaio, secretary of IARU Region 2, and to M. Fujioka, secretary of IARU Region 3. The flag of IARU was presented to the participants by the Norwegian delegates, while a station with the special call, IP9IARU, started working and in 6 days made over 10,000 contacts.

Thirty-three nations of Region 1 attended the meeting with delegates while others gave proxy to participants. The meeting was later split into different committees, each one with different duties.

The elections of the Executive Committee resulted in PA9LOU being president for the next three years, following the 10 years he has already been in that position. Also elected was vice president SP5FM. The secretary has always been English: G2MI first, G6CL later, and G2BVN until his death; G5CO filled the vacancy. Elected now was a new but very well-known Englishman, John Allaway G3FKM. Other members now are YU7NQM, EL2BA, and I1RYS.

Here are a few of the results of all the meetings and of all the talks.

1) Emphasis has been given to the situation of 7.0-7.1 MHz. This band is at the present used by many broadcasting stations while it has been assigned to amateur use. A recommendation to all the participants has been made in order to put pressure on the ITU to transfer broadcasting to other sectors of the spectrum.

2) The Region 1 members are committed to give assistance to the countries (mainly in Africa) where the amateur service is jeopardized by the economic situation.

3) A group in charge of a European common license is working on this subject and will continue the study of feasibility.

4) A recommendation to all the countries participating has been made in order to limit the proliferation of special prefixes and contests. (I do not like it!)

5) The 17th of June has been declared QRP day.

6) The automation of the QSL service in many countries will not in the future allow the use of QSLs not in line with the actual size limits of 9 cm × 14 cm.

7) Each participating country will have to work on the local telecom administration in order to have the AMTOR A & B system of RTTY recognized and allowed.

8) The 10-MHz band must not be used to transmit local bulletins and other association news.

9) During worldwide and local contests, a certain portion of the band has to be left free for normal use by amateurs not participating in them.

10) A coordinating committee on propagation and sun activity has been promoted. The coordinator is Alan Taylor of RSGB.

11) The official language of IARU has been confirmed to be English.

12) Where the 50-MHz band is not open to amateurs, it is recommended that the local league start approaching the authorities in order to obtain temporary permission.

13) The R9 144-MHz repeaters have to be deactivated immediately to avoid interferences with OSCAR 10. All local associations are invited to stop the tremendous increase in the number of FM repeaters. The use of FM below 145 MHz has to stop, and the 145,250-145,475 portion of the band will be used for local FM.

14) The beacon band has been extended to 432.8-432.99 MHz.

15) A band plan for 1.3 GHz has been approved.

16) The new WW-Locator has been approved and recommended for immediate implementation.

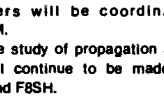
17) Distance records verified by VHF managers will be coordinated by SM5AGM.

18) The study of propagation above 30 MHz will continue to be made by the RSGB and F8SH.

19) Rules have been established on satellite activities.

* * * * *

April 25, 1874, was the birth date of Guglielmo Marconi, and to commemorate it, a meeting was held near Bologna. In the same room where Marconi made a lot of experiments there is now station IY4FGM, and in a future column I will give a full report of the commemoration.



LIBERIA

Brother Donard Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
PO Box 1005
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Republic of Liberia

AMATEUR RADIO IN LIBERIA

Amateurs are confirmed junk collectors. To convert them is hopeless. Their wives have learned to accept this fact and live with it.

The modern age with its transceivers that can do everything has not really changed the amateur. He is innovative and is always trying something. And they are so enthusiastic about their findings that they write about them in *73*. What is more, their articles are read. I am going to build the antenna featured in the February issue, page 10. It promises to be exactly what I need for my club station.

When I came to Africa I found myself without a junk box. The realization crept up on me and developed into a real frustration. Every time I needed something, even a little bolt or nut, I didn't even have a place to dig for it. I wrote to an old friend in the States and asked him to please send me some junk. He did. He sent bolts, nuts, and washers. He sent coils, capacitors, pots, all sorts of things. It was well worth the shipping cost.

It took me two years to get what I would call a working supply of junk. One local company retired an outmoded computer. Another company rebuilt its whole electrical system. Since we are a school, I was invited to salvage whatever I could use. Well, I had a field day! I hauled home relays, meters, transformers, motors, piles of circuit boards, wire of all sizes and shapes, and all sorts of nice things. I am still in the market and looking for whatever I can get but I am reasonably comfortable and happy.

Last week one of my friends here found himself off the air. His power supply had blown two high-Amp voltage-regulating transistors and a high-Amp bridge circuit. The parts store had substitutes for the voltage regulators and my junk box supplied four high-Amp diodes and a heat sink. The radio is back on the air and the radio doesn't even know that its power supply has makeshift parts.

This is the time of the year when I teach budding amateurs, both young and old. To liven the class and bring life to some of the dull theory, I went back to the junk box. I made a spool with two blocks of

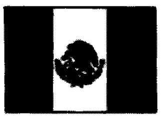
wood and the core form from two rolls of toilet tissue. (These amateurs will find a use for just anything.) I wound on several hundred turns of hook-up wire salvaged from a computer cable. I tested it and added turns until the current from a 120-volt-ac line ran about twenty-seven Amps. When I inserted a solid bar of iron, as shown in the diagram, the current dropped to fifteen Amps. This was not satisfactory at all so I made a laminated core out of some 25 horizontal layers of lengths of steel banding which came to us on shipping crates (sandwiched between more layers, vertically). I taped it together with plastic electrical tape. With this core through the coil, the current was not even measurable with the meters that we have.

I wound a doughnut-shaped coil with about 35 turns and soldered a flashlight bulb across the ends. I then cut a couple of solid-copper and solid-aluminum rings from a piece of pipe (in each case) and with these materials I went to class. The total cost of my "Gee Whiz" show was zero, but the students thoroughly enjoyed it. They saw the laws of physics in action.

The coil with its iron core is a basic transformer primary. The differences in current drawn by the coil with no core, with a solid-iron core, or with a laminated core illustrate one of the factors that affects transformer efficiency. If the core is set so that it extends five or six inches above the coil, it will throw off a copper or an aluminum ring (Lenz's law). If you hold your hand over the core so that the ring cannot escape, it will float in space and get hot. It is now a short-circuited secondary. The coil with its bulb constitutes a secondary with a load. The bulb will glow more and more brightly as the coil is brought nearer to the primary with its core. For an added attraction, drop the whole doughnut coil with its bulb into a beaker of water. The bulb will glow under water if the beaker is set on the primary coil.

This is just a start. With a small iron pan you could fry an egg or boil water in this changing magnetic field.

There are those who say that amateurs, with the advent of the modern integrated circuits, have lost the old spirit. They are wrong. The amateur will always have his junk box and his workshop. Today some amateurs are building an OSCAR and some of the rest of us are building new antennas or fixing power supplies.



MEXICO

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Mexico, D.F.

I recently got back from a business trip to New York City and was very pleased to have met quite a few colleagues (ham operators). Especially interesting was my visit with the Bridge Radio Club in Brooklyn, at Watchtower Headquarters! Things are really booming for our friends up there in the far north!

Here in Mexico City, rumors are that a new repeater is being (or has been) installed and that a new radio club is being formed. I'll have to get back on the ball and get facts for you, especially if you are planning a trip to Mexico in the near future.

Plans had been made for an expedition to the volcanoes here near Mexico City for the beginning of this year, but my trip to New York got in the way and plans are underway again for our DXpedition through the Paso de Cortez which goes right between the two volcanoes—their names being Popocatepetl (5,452 meters high) and Iztaccihuatl (5,386 meters high). Date of expedition: September 1 and 2, 1984; frequencies: 28.591 (10 meters), 21.375 (15 meters), and 14.307 (20 meters). You probably will find me on frequency (on any of the above settings) all day and all night!

Again I would like to remind our Mexican readers to please rush me any information on current events in their local areas, so as to keep *73* readers informed. To me it's exciting to be able to be part of an expedition or special occasion without even having to leave my home!

It was a pleasure to receive a copy of the Spanish edition of *QSL* right from Spain! Wouldn't it be nice for Wayne Green to entertain our Spanish readers! Imagine *73* in Spanish! I wouldn't mind doing some translating for him myself. It would be worth the effort so as to have top-class technical reading in Mexico and other Spanish-speaking countries! For those who would like information on a Spanish subscription to *QSL*, write to *QSL*, C/. Jerez, 3-Madrid-16, Spain.

I have to apologize to readers for the slight period of no articles due to my recent trip out of the country, and to those who wrote me, such as W9OX, N9FFU, KA0FPJ, and many others. Some asked for information about obtaining a license here in Mexico while on vacation. (Please see my earlier columns with detailed information on this.)

Any of you who would like to contribute ideas for my expedition between the two volcanoes and future expeditions, please contact me immediately. Perhaps you may have ideas for equipment or rare antennas for 2 meters, 10 meters, 15 meters, and 20 meters. Any information will be appreciated.

So, as we say down here south of the border, Hasta pronto amigos! Mucho 73 y DX!

NEW ZEALAND

D. J. (Des) Chapman ZL2VR
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New Zealand

Chatham Islands, ZL7, are composed of two main islands, Chatham and Pitt, and a number of smaller islands. They are located about 850 kilometers from the New Zealand mainland. Chatham Island, the main island, is about 50 kilometers long and has a large lagoon stretching about half its length. Half of the total population of approximately 740 lives in or around the main township of Waitangi. The main industries are farming, fishing, and the associated processing works for these activities.

Amateur-radio activity from Chatham Islands varies, as there are not many permanent resident hams there; most of the amateurs active there are members of the Post Office Radio Station staff who work on the island for specific periods of one or two years' duration. Occasionally an amateur is sent to Chathams for relief purposes, and such a temporary residence is of a shorter period. In this category are Allan ZL2BKM/C (his first trip was in 1983) and ZL7BKM, relieving radio operator for about three months from late May.

The Post Office Radio Station provides varying radio services which include maintaining a 24-hour radio watch on the international distress frequency, 2182 kHz. It routinely broadcasts weather and coastal information and traffic lists to shipping and transmits and accepts telegrams from ships. The station also provides an Aeradio service, air-ground and point-to-point circuits for the Civil Aviation Department. It handles inland telegraph transmitting and receiving, with Gentex offices on the mainland, and Radphone, the radiotelephone link with mainland New Zealand, carrying all the telephone traffic between the islands and the mainland. Radiotelephone messages are "scrambled" en route to maintain confidentiality.

Land mobile, ZLC, the Chatham station's callsign, is the only New Zealand radio station that monitors land-mobile radio circuits, as most of the islanders have radiotelephones in their vehicles for use in case of an emergency. The other service the radio station provides is also unique for a radio station. ZLC provides the night telephone-switched subscriber service which gives the telephone subscribers an emergency facility outside the telephone exchange hours, as the radio station is staffed 24 hours continuously. Anyone requiring assistance can ring in from any one of a number of specified telephones around the islands which are night-connected to the radio station where the watch operator looks after the telephone call.

The Post Office first came to the Chatham Islands in 1856, the mail service being by sea "as opportunity offers." About 1888, when a regular shipping service commenced, this gave a hint of regularity to the mail service. From that time the Post Office offered only a limited service to the residents of the island, until a telephone exchange was opened on the island in 1962.

The radio station was first established at Chathams in September, 1913, with all traffic handled on a radiotelegraph basis. A radiotelephone link was opened between the mainland and Chathams in May, 1953, and in the early days of the radiotelephone link, subscribers had to attend the radio station to make and receive their telephone calls from New Zealand. In August, 1965, the Chathams were linked to the New Zealand Post Office toll system, and subscribers were, from that date, able to make all their toll calls from their homes or offices.

The Chathams group of amateur operators includes Lester ZL7PO, the manager of the N.Z. Post Office Radio Station, Chris ZL7OY, a County Council employee, Ian ZL7TKI, a Works Department employee, and Dave ZL7PA, Tai Rio ZL7TZ, Stephanie ZL7BJE, and George ZL7BSQ, all employees of the Post Office, many of them at the radio station.

BITS 'N' PIECES

Ron Badman ZL1AI, a New Zealand Post Office engineer from Hamilton, has in his spare time designed and built a device to assist visually-impaired amateur operators and listeners. Ron's device is a voice readout which announces the exact frequency on the tuning dial to several decimal places. Similar in principle to a talking clock, the device links a speech-synthesizer chip with the necessary circuitry to convert the visible readout information into sound. The voice chip and the necessary electronics are mounted on a circuit board and installed inside the rig or receiver. The prototype was installed in a Kenwood R600 receiver with a button to activate the readout, which sounds through the same speaker as the audio output.

The device has attracted wide interest in the amateur field, and several of the speech-synthesizer frequency readouts have been made by a Hamilton group for use by some of the estimated 30 or so blind amateur-radio operators in New Zealand.

ROSE CITY CONFERENCE

The 58th Annual NZART Conference and Convention was held at Palmerston North over the weekend of June 3-5 and was called the Rose City Conference because the host city is known as the City of Roses. The host for the weekend conference was a Combined Committee from the Central Districts Branches of NZART consisting of representatives from the Marton, Manawatu, Feilding, Pahiatua, and Dannevirke branches, assisted by members from those branches also.

The Conference was opened on Saturday by ZL1MU, Air Vice-Marshall David M. Crooks, OBE, Chief of Air Staff, Royal New Zealand Air Force, after welcomes were given to delegates and members of NZART from the President Don Mackay ZL3RW and the Palmerston North Mayor, Mr. Brian Elwood.

Amongst the special guests were Dan Wilkenson ZL2AB, who holds amateur license number 2, is the oldest amateur in ZL, and is still active on the air. Dan has been active in amateur radio for 61 years and has held the same callsign for the whole period. Another special guest, Jim Smith KA7APJ from Seattle, Washington, has attended NZART conferences before and is almost a ZL now that he holds the callsign of ZL2BOR. I understand Jim also will be contributing to New Zealand land tax funds now that he has become a landowner "down under."

Amongst the weekend activities, besides the usual domestic conference business sessions on Saturday, were meetings of the various sections of NZART on Sunday. In all there were 320 ZL registrations and one overseas visitor; this would be about 250 amateurs and their partners. Trade displays were featured from the local agents of Yaesu, Kenwood, and Icom, as well as some ZL firms, Southern Cross Electronics, AWA, Tricity House, Ryel Electronics, and Roz Craft Quads.

Amongst the Certificates of Merit awarded by NZART Council before the conclusion of the business sessions was one to Ian Ashley ZL1AOX, an AMSAT member, for his work as an AMSAT Ground Command Station for the Phase III series of craft. The "Stirrers Award" (for the delegate who debates the most contentious points) went to ZL2AUS, the Wanganui delegate.

Next year's NZART Conference, the Garden City Conference, will be held in Christchurch, the Garden City on New Zealand and capitol of ZL3 land in the South Island. All the conference activities will be at the Canterbury University Ilam complex, with displays, technical lectures, discussion groups, and trade displays, besides the usual business sessions of NZART and its associated bodies, the Old-Timers Club, Women Amateur Radio Operators, Amateur Radio Emergency Corps, AMSAT, VHF Forum, etc.

NZART has obtained several pages of *Teletext* free of charge, and amateurs are invited to send in suitable information for inclusion in the *Teletext* pages to *Break-In*, or to Doug Gorman ZL2IY. *Teletext* is reasonably new to New Zealand, and this

Continued on page 104

CONTESTS

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DARC CORONA 10-METER RTTY CONTEST
1100 to 1700 GMT September 1

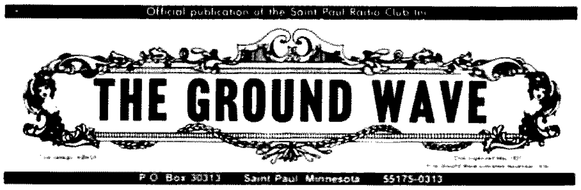
This is the third of four tests during the year sponsored by DARC to promote RTTY activity on the 10-meter band. Each of the four tests is scored separately. Use the recommended portions of the 10-meter band.

EXCHANGE:

RST, QSO number, and name. US stations also give state.

SCORING:

Each station can be contacted only once. Each completed two-way RTTY QSO is worth 1 point. Multipliers include the WAE and DXCC lists, each district in VE/VO and VK, plus each different US



NEWSLETTER OF THE MONTH

How do we pick a monthly winner in our newsletter contest? What are the criteria? Flashy graphics? Length? A flipped coin? Many editors and club members have been asking just what must be done to get their publication chosen out of the hundreds of newsletters we review each month.

Here's the magic formula: consistency. That's it. This month's winner, *THE GROUND WAVE*, is a perfect example. Month after month, Editor Marv Mahre WØMGI and the St. Paul Radio Club, Inc., put out a quality publication. It's not the longest one we see, or the flashiest, but it's always interesting. It's full of news and reports about the club and its members, complete with revealing pictures.

Look at your club's newsletter. Can it stand up next to *THE GROUND WAVE*? Do your members read it cover to cover or consistently toss it onto the rubbish heap?

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

CALENDAR

Sep 1	DARC Corona 10-Meter RTTY Contest #3
Sep 8-9	ARRL VHF QSO Party
Sep 15-16	Ohio QSO Party
Sep 15-16	CAN-AM Contest—Phone
Sep 15-17	Washington State QSO Party
Sep 15-17	Kansas State QSO Party
Sep 21-23	Maine QSO Party
Sep 22-23	Late Summer QRP CW Activity Weekend
Sep 22-23	CAN-AM Contest—CW
Oct 6-7	ARRL QSO Party—CW
Oct 13-14	ARRL QSO Party—Phone
Oct 13-14	Rio CW OX Party
Oct 13-14	Columbus Day International OX Contest
Oct 13-15	Oregon QSO Party
Oct 13-15	Rhode Island QSO Party
Oct 20-21	Jamboree On The Air
Oct 20-21	Worked All Y2 Contest
Oct 20-21	CLARA Ac/Dc Contest
Nov 3	DARC Corona 10-Meter RTTY Contest #4
Nov 3-4	ARRL Sweepstakes—CW
Nov 17-18	ARRL Sweepstakes—Phone
Dec 1-2	ARRL 160-Meter Contest
Dec 8-9	ARRL 10-Meter Contest
Dec 26-Jan 1	QRP Winter Sports—CW
Dec 30	Canada Contest

RESULTS

KE5CV, KD7P/KH2, K3TUP, AND I4KDJ: 1984 WORLD 40-METER SSB CHAMPS

"Big signals from Texas," states VE3NVO. "I made 143 QSOs in an hour!" said WC4E, overwhelmed with all the activity. "An excellent contest. . .at 24 hours, the XYL can almost stand it!" comments station K3TUP.

The 1984 40-Meter World Championship event is now history. There were some good times and along with that, bad. For the most part, propagation was spotty at best. From the outset, however, persistence paid off for those who chose to stick it out through the wee morning hours. The later in the evening and the earlier in the morning it got, the better conditions became.

From the looks of the scores, stations in Europe and Asia had a field day working each other and had even greater success increasing their DX totals working within their own continents. Stations in Asia seemed to have had better luck working the USA than their counterparts in Europe. Stateside, the same held true. While the DX countries worked were fewer than in years previous, the QSO counts within the States brought new records for some.

Analyzing the entries, over 85 individual DX countries were logged by those participating in the contest. With that kind of support, it is unfortunate that more DX stations don't send in their contest logs—most would be award winners!

In the single-operator category, only 5210 points separated the first and second place W/VE stations. After all the smoke had settled, KE5CV had risen to become the 1984 World 40-Meter SSB Champion. With 1020 QSOs, 55 states and provinces, and 33 DX countries, a total of 473,000 contest points were accumulated. A fantastic job for such rugged conditions—truly a championship class of operation.

The top three stations, KE5CV, KE5IV, and W1WEF, all surpassed the rest of the field by nearly half again as many QSOs. KE5CV and W1WEF each recorded new World-Championship QSO records. W1WEF had more QSOs in his operating class than anybody. Stations with 500 or more QSOs included: W1WEF (1042), KE5CV (1020), KE5IV (953), KAIGG (676), KQ1F (645), KI2G (643), KB5FU (613), NC2Y (613), K1KJT (594), WD8IVL (593), KI7M (585), KD4TQ (562), and K9MWM/Ø (539).

For DX stations, KD7P/KH2 in Guam captured the World Championship in his single-operator class. Propagation stateside wasn't the best, as only 20 states and provinces were accumulated. A total of 470 QSOs were conducted, however, and 36 DX countries were worked for a total of 228,200 contest points.

How do the record performances of this year's single operators compare with records of prior years? Let's look at contest QSO record totals and see how some fared:

W1WEF	1984	1042	W9RE	1982	851
KE5CV	1984	1020	N3AMK	1982	771
VE5DX	1982	972	KA1XN	1982	761
KE5IV	1984	953	WB8JBM	1982	759
KK9A	1982	856	KC5NQ	1983	756

Many stations in the single-operator class managed to work all states. As before in previous contests, Canadian provinces were at a premium. That apparently holds true in all contests, however.

Stations with 50 or more states and provinces to their credit included: KE5IV (57), NC2Y (56), KE5CV (55), W1WEF (55), KB5FU (55), KQ1F (54), K4JPD (53), KA1GG (53), KD4TQ (52), VE3MFA (52), KA7DLV (51), KI2G (50), W4TMR (50), WD8IVL (50), KT1J (50), KVØI (50), and N8CXX (50).

For W/VE contestants, KE5IV, KE5CV, VE3MFP, VE3MFA, and K9MWM/Ø were the only stations with 30 or more DX countries worked. They tallied 36, 33, 32, 31, and 31 countries respectively. For DX stations in the same category, 4U1ITU worked 44 countries, followed by OK1TN (42), EA3CCN (42), PY5EG (41), ZL1BQD (40), KD7P/KH2 (36), LX1JX (32), and JH3TKM (30).

In the multi-operator class of operation, the new World Champion for W/VE stations is the crew from Pennsylvania station K3TUP. Not only did they tally 538,095 contest points, the next to the largest score in the entire contest (I4KDJ had 545,090 points total), but also they came very close to setting a new World Championship QSO record, falling short of their last year's world record by only 18 QSOs. K3TUP worked 1196 stations, 56 states and provinces, and 31 DX countries—these folks were definitely burning the midnight oil, rotating up to 7 operators at the station. A superb job, to say the least.

Compared to previous contests, K3TUP now holds, in his class, both the world record and the second-highest QSO count in the World Championship contest. The top ten are:

K3TUP	1983	1214	KD4TQ	1982	972
K3TUP	1984	1196	W2ZQ	1984	944
K8ND	1983	1129	NW4B	1984	930
N9NB	1982	1098	KYØS	1984	928
K9EC	1984	1008	NA4L	1984	911

Nearly all the North American multi-operator entries worked all 50 states, with Canadian provinces again being the shortfall. Stations with 50 or more W/VE multipliers included: NW4B (57), K3TUP (56), K9EC (55), WA3SPJ (55), KYØS (54), NA4L (54), W2ZQ (54), KS9O (54), WA6PVA (54), KA4RDG (53), KM8U (53), KBØQA (53), KE6WA (52), and W9ZX (52).

Stations in Europe (as can be expected) managed to work predominately within their own continent to build their contest scores. I4KDJ was the world top multi-operator DX station with 638 QSOs, 25 states and provinces, 68 DX countries, and 545,090 points. Unfortunately, this year propagation to the states was almost nonexistent. Following I4KDJ, with 66 countries worked, were OK1KSO (64), DL8NBE (46), NW4B (32), K3TUP (31), and KYØS (30).

Analyzing the contest logs for this year's event and comparing them to those previous, we find some interesting statistics on antennas which will give you an idea how amateurs are equipping their stations.

ANTENNAS USED (%) IN THE 40-METER CONTEST

	1982	1983	1984
Dipole/inverted vee	39.8	44.6	45.6
1/4-wave vertical	13.9	4.8	2.6
Trap vertical	9.3	11.5	4.4
2-element yagi	7.0	9.6	7.0
1/4-wave sloper	4.6	.9	10.6
1/2-wave sloper	2.3	6.7	1.8
Delta loop	9.3	3.8	1.8
2-el. wire beam	2.3	0	2.6
3- or 4-el. yagi	2.3	9.5	15.7
Longwire	0	4.9	.6
1- or 2-el. quad loop	2.3	0	.9
Bobtail curtain	2.3	0	2.6
Other	4.6	3.7	3.8

Reviewing the antenna survey, one can quickly realize the influence of antenna articles which appeared during the past couple of years in major amateur-radio publications. We see a trend moving from the trap vertical to a 1/4-wave type; 3- and 4-element beams are now more dominant than ever before, and because of recent articles on sloper systems, we see more amateurs home-brewing their own, for contesting purposes especially.

As I talked with many of you on the air, it seemed that many plans were made during the summer to erect that new array. I hope you didn't procrastinate as I did. The 2-element yagi never grew that 3rd element nor the additional boom length. With only months to go before the 4th annual event, we all have time to get our systems ready for greater accomplishments. Then again, maybe that 40-meter dipole will do me another year? Meet me on the band in January and we'll find out how well each other's antenna projects panned out. That's January 14, 1985, for the 4th annual 40-Meter SSB World Championship Contest.

In the meantime, you might send for the 1985 rules and contest summary sheets. Forward an SASE to the 40-meter contest chairman, Dennis Younker NE6I, 43261 Sixth Street East, Lancaster CA 93535. See ya on the band!—*Bill Gosney KE7C.*

40-METER CONTEST SOAPBOX

OE1WWL	No propagation to the States this time!
N2EEC	A newly-discovered, fun contest! One I'll support from now on.
W2ZQ	This multi-op station had 27 operators!
VE3DWE	My first contest attempt.
VE3MFP	Disappointed in the activity at first but it sure picked up later, without doubt! Must have been propagation.
VE3NVO	Big signals from Texas during late night and early morning. Wish I had a beam???
WA3SPJ	Propagation not as good as I hoped. The European opening never came. Still the best of the seven contests I enter each year!
K3TUP	This is an excellent contest. At 24 hours, the XYL can almost stand it.
WC4E	Made 143 QSOs in an hour! Wish this contest didn't conflict with the ARRL QSO party.
W4TMR	An excellent contest—had a great time.
KB5FU	5 new countries and 2 new zones including zone 18. Not bad for a few hours' work.
WA8PVA	Very disappointed I couldn't find a Maine station for WAS. The 4-element beam came down 5 days before the contest.
ZS6WB	Thunderstorms—and QRN level of 20 dB over S9 from 1400–1700Z.
KE7C	Heard nearly 50 countries conversing with one another but few were listening crossband in the US segment.
WD8NHN	Hard to work a contest and run a business. Would like to have spent more time on the air.
KM8U	First time for us to work 48 states, KL7, and KH6 all in one night on this band.
JH9EPA	Good contest.
EA9KQ	Poor conditions to the USA.
KG9O	Only worked 4 hours. Had a great time nevertheless. Next year I hope to spend the entire time contesting.

1984 RESULTS
40-METER WORLD SSB CHAMPIONSHIP

Indicated are callsign, QTH, QSOs, states/provinces worked, DX worked, and total score. **World champion; *Certificate winners.

W/VE Single Operator

**KE5CV	TX	1020	55	33	473,000
KE5IV	TX	953	57	36	467,790
*W1WEF	CT	1042	55	23	424,320
KB5FU	TX	613	55	28	270,995
*KA1GG	MA	676	53	17	245,000
*K9MWM/Ø	CO	539	49	31	239,600
*KI2G	PA	643	50	20	236,250
KQ1F	MA	645	54	14	227,800
*NC2Y	NJ	613	56	12	214,880
*KD4TQ	KY	562	52	21	214,620
*KI7M	OR	585	48	17	207,025
*K4JPD	GA	430	53	29	197,210
*WD8IVL	OH	593	50	12	187,860
K1KJT	MA	594	50	9	178,770
*W4TMR	NC	390	50	18	140,080
NN4K	GA	406	48	15	132,615
*VE3MFA	ONT	222	52	31	112,050
*KT1J	VT	416	50	1	108,335
VE3MFP	ONT	236	38	32	102,900
*KA7DLV	MN	328	51	5	93,520
*KVØI	NB	336	50	4	92,070
K3OX	PA	311	40	13	86,920
*N8CXX	MI	347	50	0	86,750
*KS1G	ME	314	35	4	62,405
*WC4E	FL	247	44	3	58,750
*WA6FGV	CA	247	46	1	58,515
*KG9D	IL	207	48	4	55,120
K6EID	CA	175	42	11	49,820
W3ARK	PA	216	38	2	43,600
W8FGA	MI	198	39	4	43,430
KN1M	ME	190	39	5	43,120
*N7BUP	AZ	148	43	10	42,665
*WD8NHN	WV	222	35	1	39,025
*KA4MTK	VA	192	38	2	38,800
*KC7PA	UT	149	41	5	35,420
*KY2L	NY	168	35	5	34,600
W8UPH	OH	176	35	1	31,680
KV9S	IL	132	39	4	29,240
W4WIJ	FL	113	37	9	28,520
*KA7BRE	NV	126	42	5	28,435
N2EEC	NJ	181	32	1	26,730
*WBØBHF	IA	132	38	1	25,740
W8VEN	WV	132	36	2	25,650
VE3DWE	ONT	169	29	1	25,500
*K3IXD	MD	114	35	4	21,450
*N7EMX	WA	99	36	4	20,600
*N5AFV	OK	78	38	3	17,630
W6OUL	CA	80	29	7	15,660
KA3FKL	PA	61	22	0	13,420
KE6PQ	CA	74	29	3	12,800
WØIZV	CO	78	32	0	12,640
*W5EIJ	AR	69	35	0	12,250
*N4JID	AL	69	32	0	11,040
VE3NVO	ONT	78	28	1	10,920
W9LYN	IL	63	24	5	9,860
K1NCD	CT	65	27	2	9,715
*KB9S	WI	58	23	1	7,080
SMØDRD/W6	CA	56	25	0	7,000
KA7AKQ	WA	45	23	2	6,000
KY9F	IL	53	22	0	5,830
WA3JXW	PA	45	24	0	5,400
W6YMH	CA	38	22	0	4,400
WA8MJY	MI	40	21	0	4,305
VE3FEA	ONT	36	19	0	3,420
NM6L	CA	25	12	0	1,500
KA2PSW	NY	15	9	1	800
NE6I	CA	11	4	0	220

DX Single Operator

**KD7P/KH2	Guam	470	20	36	228,200
*4U1ITU	ITU/Geneva	365	2	44	167,440
*OK1TN	Czech.	239	24	42	137,610
*ZL1BQD	New Zealand	232	13	40	90,630
*EA3CCN	Spain	157	8	42	76,250
*PY5EG	Brazil	159	41	15	49,280
*LX1JX	Luxembourg	147	1	32	48,345
*JH3TKM	Japan	126	3	30	41,085
*EA9KQ	Cueta/Melilla	114	16	25	39,565
*ZS6WB	South Africa	114	14	23	37,555
*AL7DX	Alaska	175	21	9	34,125
*Y33TA	E. Germany	92	0	24	22,080
EA7ABW	Spain	88	20	13	19,140
*DF8ER	W. Germany	82	0	21	17,220
*OE1WWL	Austria	54	0	27	14,580
*G4IVJ	England	62	0	23	14,260
*4X6DK	Israel	59	0	17	10,030
OK1KZ	Czech.	48	0	16	7,680
EA3ALV	Spain	38	3	16	6,935
Y22WF	E. Germany	43	0	13	5,590
CT1TM	Portugal	16	1	9	1,550
I4CSP	Italy	13	0	10	1,300
JH9EPA	Japan	14	3	5	960
EA3BWX	Spain	11	0	7	770
JA6YBR	(JF6DEA operator) —Japan	9	2	6	640
EA3DNC	Spain	10	0	6	600
JHØQNT	Japan	6	1	5	330

W/VE Multi-Operator

**K3TUP	PA	1196	56	31	538,095
*K9EC	WI	1008	55	27	449,360
*NW4B	NC	930	57	32	433,875
*KYØS	CO	928	54	30	412,020
*NA4L	VA	911	54	19	342,735
*W2ZQ	NJ	944	54	15	330,855
*WA3SPJ	PA	802	55	22	319,550
KA4RDG	VA	838	53	19	309,240
*KS9O	IL	790	54	19	296,380
*KM8U	MI	763	53	17	275,100
*KE6WA	CA	552	52	14	188,430
W9ZX	IL	678	52	3	187,275
*KBØQA	SD	531	53	10	173,565
*WA6PVA	OR	424	54	14	151,640
*N4EJW	FL	465	49	12	147,925
*N4JII	TN	360	49	3	93,600
*N4FKF	IN	295	46	0	67,850
*N2EIK	NY	309	41	2	66,865
*KE7C	WA	143	45	15	48,900
*KB7M	WY	108	34	1	19,075

DX Multi-Operator

**I4KDJ	Italy	638	25	66	545,090
*OK1KSO	Czech.	437	20	64	307,020
*NP4CC	Puerto Rico	599	51	18	217,005
*DL8NBE	W. Germany	378	6	46	194,220
*HL9FY	Korea	105	3	17	20,200
*JA3YKC	Japan	53	3	13	8,160
*JA2YKA	Japan	18	6	7	1,625

Multi-Operator Participants

N2EIK	N2EIK, WA2KHP, N2DRR
W2ZQ	(27 operators)
WA3SPJ	WA3SPJ, K3WGR, W3UM, WB3CAC
K3TUP	(7 operators)
KA4RDG	KA4RDG, WK4Y
N4EJW	N4EJW, N4EJV
N4FKF	N4FKF, KA9ORW
N4JII	N4JII, NY4N, WC4S
NA4L	(7 operators)
NW4B	(7 operators)
WA6PVA	WA6PVA, WA7OXH
KE6WA	KE6WA, W6SKQ, KF6VK, KF6BC
KB7M	KB7M, KB7WN
KE7C	KE7C, WB7OJV
KM8U	N8AKY, KA8LDO
K9EC	K9EC, AC9C
KS9O	KS9O, KC9XM
W9ZX	W9ZX, N9ECF
KBØQA	KBØQA, WDØCXU
KYØS	KY9S, ADØO, KØUKO
DL8NBE	DL8NBE, DJ9MH
HL9FY	HL9RC, HL9FG, HL9WS
I4KDJ	I4KDJ, I4YNO, I4JMY, I4YSS, I4OUT, I4USC
JA2YKA	JI2NPL, JR2GMC
JA3YKC	JH5EML, JR8NWN
NP4CC	NP4CC, KP4BZ, NP4Z
OK1KSO	OK1JCW, OK1AEZ

state. The final score is the total number of QSOs times the total multiplier.

AWARDS:

Awards to the leading stations in each class with a reasonable score present. Operating classes include: Class A for single or multi-op and Class B for SWLs.

ENTRIES:

Official logs are recommended and are available from the contest manager (SASE or IRCs are appreciated). Logs must contain name, call, and full address of participant. Also show class, times in GMT, exchange, and final score. SWLs apply to the rules accordingly. Logs must be received within 30 days after each test. Send all entries to: Klaus K. Zielski DF7FB, PO Box 1147, D-6455 Erlensee, West Germany.

The remaining contest period is on November 3rd.

WASHINGTON STATE QSO PARTY

0100 to 0700 GMT September 15
1300 GMT September 15 to 0700 GMT September 16
1300 GMT September 16 to 0100 GMT September 17

The nineteenth annual contest sponsored by the Boeing Employees' Amateur Radio Society (BEARS) is divided into 3 operating periods as shown. All amateurs are invited to participate. All bands (except 10.10 to 10.15 MHz) and modes may be used, but no CW QSOs are allowed in the phone bands. Stations may be worked once on each band and mode for contact points and more than once each band/mode if they are additional multipliers.

EXCHANGE:

QSO number, RS(T), and state, province, country, or Washington county.

FREQUENCIES:

Phone—1815, 3925, 7260, 14280, 21380, and 28580; CW—1805, 3560, 7060, 14060, 21060, and 28180; Novice—3725, 7125, 21150, and 28160.

SCORING:

Washington stations score 2 points for each phone contact and 3 points for each CW contact, including contacts with other Washington stations. Multiply QSO points by the total number of different states, Canadian provinces, and other foreign countries worked.

All others score 2 points for each phone contact and 3 points for each CW contact with a Washington station. Multiply QSO points by the total number of different Washington counties worked (39 maximum). There will be an extra multiplier of one for each group of 8 contacts with the same Washington county for all non-Washington stations.

AWARDS:

Certificates will be awarded to the highest-scoring station (both single and multi-operator) in each state, Canadian province, foreign country, and Washington county. Additional certificates may be issued at the discretion of the Contest Committee. Worked Five BEARS Awards are also available to anyone working 5 club members before, during, or after the QSO Party (unless previously issued). All QSO Party entries will be screened by the Contest Committee for possible Worked Five BEARS Awards. Worked Three BEAR Cubs Awards are also available for working 3 Novice members. All BEARS Awards besides OSO Party certificates are handled by Roy Brashear W7RJW, 5711 South 129th Street, Seattle WA 98178. (See page

RESULTS

N4BAA, K1WW, AND ZL1BQD: 1984 WORLD 75-METER SSB CHAMPS

"Great contest," states 4U1ITU. "Sounded like a madhouse over here in Geneva." "The DX was great," says NA4L, who worked some new ones. "Worked all 50 states in one night," crowed W4TMR.

For many, the contest meant getting on for a new state or just adding to DXCC totals. For others, this year's event was nothing short of pure (excuse the expression) blood and guts!

As we compare the scores to those of prior years, you can see, as KI0F stated, the quality of operators—not to mention the quantity of stations heard on the air—is getting better with each and every event. I wonder how many still had the energy to stay up and watch a football game Sunday afternoon? From the looks of the QSO count, it looks like some operators never went to bed at all!

Congratulations to N4BAA, the 1984 World Champion for the single-operator category. I listened to Jose from time to time, and boy, was he ever going to town! You'll note he outperformed Larry N7DF in multipliers, which says he had a definite advantage in working DX countries. Nonetheless, it was a very close race considering that N7DF tallied 1076 QSOs for a new world record for 75-meter QSOs, outdoing N4BAA by 182 Qs! See the stats below. Whew, that's a lot of contacts for 75 meters . . . great job, Larry!

N7DF	1984	1076
N4BAA	1984	894
N5AU (K5ZD op)	1983	777
N8II	1983	730
K0HA	1984	725
KG1E	1983	722
N2NU	1984	722
AD0O	1984	721
N7DF	1982	700
KA1XN	1984	682

W/VE stations this year in the single-operator class with 500 or more QSOs included N7DF (1076), N4BAA (894), K0HA (725), N2NU (722), AD0O (721), KA1XN (682), K0CS (608), KB3A (608), KC8JH (600), KV0I (574), WA1UJU (533), W4TMR (517), and W5VUX (515). The list steadily grows each year as sunspot activity favors 75-meter operation.

In the DX world, hats off to ZL1BQD of New Zealand, who became the 1984 75-meter champion for single-operator DX stations. With nearly 75 multipliers to his credit, Mr. Runciman tallied 137,625 contest points. His score nearly doubled that of second-place finisher EA3CCN of Spain. Like these two fellas, we hope our amateur friends worldwide will continue to support this annual event. We all look forward to meeting you on 75—a lot of us for that first-time contact.

In the multi-operator category, this year's World Champ for 75 meters is Ray K1WW (with KR1V sharing the mike). This New Hampshire station accumulated 675 QSOs and 98 multipliers for a winning contest score of 380,730 points. Only 34 QSOs and 1 multiplier separated Ray and second-place finishers (NA4L and company). While the stats appear close, Ray did manage to work more DX stations, giving him the point advantage he needed to win. Both crews are to be commended!

Not to be forgotten are this year's accomplishments of station K9EC, who finished 3rd place overall. K9EC came within 19 QSOs of setting a new world record for 75-meter multi-operator stations. Refer to the statistics below:

N9NC	1982	793
K9EC	1984	774
K1WW	1984	675
N4TY	1983	655
NA4L	1984	641
KI4DC	1984	629
KS9O	1984	594
KM8U	1984	584
KA4JNC	1983	571
VE2ZP	1982	567

Probably one of the greatest challenges facing all of us each year is our insistence during the summer (some of us wait until it snows) to home-brew still a better antenna than we already have, for next year's event. I'm sure all of us have said it at one time or another. (I guess that's my own guilt coming through since I've been consulting Rush W7RM about a respectable bobtail for 75.)

It seems for this band, however, that the experimenter's instinct has not lost its grasp. From the comparison chart you can see that year after year our contestants favor the inverted vee or dipole, but more and more are putting up various kinds of second 75-meter antennas and giving them a try.

ANTENNAS USED (%) IN THE 75-METER CONTEST

	1982	1983	1984
Inverted vee/dipole	43.8	65.9	38.9
1/4-wave vertical	8.3	11.1	9.6
1/2-wave sloper		2.4	6.3
1/2-wave multi-sloper			5.3
1/4-wave sloper	11.1	5.3	4.2
Phased vertical	5.5	1.1	4.2
2-element wire array	5.5	1.1	9.5
Inverted-L	2.7	2.2	5.3
Full-wave loop	11.1	5.4	5.3
Zepp			4.2
Discage array			3.6
Longwire	7.2	3.3	.9
Bazooka	2.8	1.5	.9
Bobtail	2.0	.7	.9
6-element vertical			.9

Contest certificates have been processed and mailed. Should you have a question regarding the 1984 contest or the issuance of a contest award, contact the 75-meter contest chairman directly. Write Jose Castillo, 1832 Highland Drive, Amelia Island FL 32034.

So it's the end of another World Championship. The 1985 75-Meter SSB Contest is only months away. Mark January 13, 1985, on your calendar. We hope you plan to participate. And please, turn in your contest logs to the contest chairman even if you worked only a few contacts. As you can see from the results, you could be a winner even with a lower-than-average score! Start pruning that sloper; we'll see you in the test!—*Bill Gosney KE7C.*

75-METER CONTEST SOAPBOX

ZL1BQD	Real good contest—keep it up!
WA3SPJ	My best year ever! Hope to get a better antenna up for next year's contest. 86 QSOs the first hour. Would like to see club scores, also.
N4BAA	Looks like the test is catching on. Lot of activity all night.
KD4IC	Extremely good contest!
NA4L	The DX was great.
W4TMR	Excellent contest. Looking forward to next year. Had a great time working all 50 states in one night!
KE5IV	Nothing like getting the 75-meter steerable array up a week after the contest—my normal good planning!
AA6EE	Better activity this year.
EA7ABW	There was no information about the contest in our Spanish magazine. (*Ed. note: We advertised the event in nearly 60 different international publications.*)
KC7PA	Lots of activity. Propagation great all night. Can't wait until next year.
WD8VEN	Hope to do better next year!
KS9O	Biggest thrill was working DL4TL at 1055Z. That's 11:55 am local time in West Germany. There was plenty of DX, especially in the South Pacific and JAs.
KI0F	A very fine contest again this year. Seems the quality of operators is getting better each year of this event. Still one of the better contests going!
4U1ITU	Great contest. Sounded like a madhouse over here with all the stations calling. Keep it up 73, you have a winner!

28 of the August, 1979, issue of *73* for more details.)

ENTRIES:

Logs must show dates/times in GMT, stations worked, exchanges sent and received, bands and modes used, and scores claimed. Include a dupe sheet for entries with more than 200 QSOs. Each entry must include a signed statement that the decision of the Contest Committee will be accepted as final. No logs can be returned. Results of the QSO Party will be mailed to all entrants and an SASE is *not* required. Log sheets and summary sheets must be postmarked no later than October 17th and sent to: Boeing Employees' Amateur Radio Society, c/o Willis D. Propst K7RS, 18415 38th Avenue South, Seattle WA 98188.

KANSAS STATE QSO PARTY

0100 to 0700 GMT September 15
1300 GMT September 15 to 0700 GMT September 16
1300 GMT September 16 to 0100 GMT September 17

This is the third annual contest sponsored by the Boeing Employees' Amateur Radio Society of Wichita (BEARS0) and all amateurs are invited to participate. Use all bands and modes. Stations may be worked once on each band and each mode for contact points, more than once each band/mode if they are additional multipliers.

EXCHANGE:

QSO number; RS(T); and state, Canadian province, foreign country, or Kansas county.

FREQUENCIES:

Phone—1815, 3925, 7260, 14280, 21380, and 28580; CW—1805, 3560, 7060, 14060, 21060, and 28160; Novice—3725, 7125, 21150, and 28160.

SCORING:

Kansas stations score two points for each phone contact and three points for each CW contact, including contacts with other Kansas stations. Multiply contact points by the total number of different states, Canadian provinces, and other foreign countries worked. All others score two points for each phone contact and three points for each CW contact with a Kansas station. Multiply contact points by the total number of different Kansas counties worked (105 maximum). For all stations multipliers are counted only *once*

1984 RESULTS
75-METER WORLD SSB CHAMPIONSHIP

Indicated are callsign, QTH, QSOs, points, multipliers, and total score.
**World champion; *Certificate winners.

W/VE Single Operator

Callsign	QTH	QSOs	Points	Multipliers	Total score
**N4BAA	FL	894	4984	116	578,260
*N7DF	KS	1076	5625	95	534,375
*N2NU	NJ	722	4265	98	417,970
*KA1XN	MA	682	3970	104	412,880
*KØHA	NB	725	3975	88	349,800
*ADØO	CO	721	3955	87	344,065
*KØCS	MO	608	3220	88	283,360
*KC8JH	OH	600	3215	85	273,275
*KB3A	PA	608	3115	68	211,820
*W4TMR	NC	517	2750	74	203,500
KVØI	NB	574	2950	63	185,850
*NA6T	CA	339	2130	87	185,310
KQ3V	PA	453	2370	74	175,380
*W5VUX	GA	515	2630	65	170,950
*KI3V/8	ND	492	2520	64	161,280
*WA1UJU	WI	533	2700	58	156,600
*KV9S	IL	428	2240	66	147,640
*KIØF	MN	436	2205	57	125,685
*KA1YR	CT	351	1885	67	124,955
KQ1Y	FL	365	1920	64	122,880
*KC8P	MI	332	1770	69	122,130
*N7KA	AR	317	1685	72	121,320
KB9S	WI	318	1715	68	116,620
*NA4D	KY	375	1915	60	114,900
*KI7M	OR	292	1685	67	112,895
*W3YOZ	MD	381	1925	52	100,100
K4JPD	GA	308	1575	57	89,775
*KA7BRE	NV	277	1415	80	84,900
*K4ADI	SC	314	1575	50	78,750
*KN1M	ME	283	1450	53	76,850
KB3TR	PA	301	1505	48	72,240
K7GWK	OR	204	1180	60	89,600
KA7DLV	MN	262	1315	50	65,750
K4JLD	PA	163	935	64	59,840
*W5TTE	NM	229	1145	51	58,395
*KU2W	NY	235	1180	46	54,280
*KB5FU	TX	193	1075	49	52,675
N8ERV	MI	261	1305	40	52,200
*WD8VEN	WV	219	1095	46	50,370
KA1VT	CT	173	880	51	44,880
KBØU	KS	141	765	57	43,605
WA9BTY	IL	160	805	53	42,665
*W9XD	IN	194	975	43	41,925
*KC7PA	UT	188	940	44	41,360
*KB3PO	DE	188	845	42	39,790
NE6I	CA	140	720	48	34,360
W8OUL	CA	123	645	53	34,185
W3ARK	PA	171	885	39	33,735
W8VEN	WV	142	715	45	32,175
KQ1F	MA	125	660	47	31,020
WB8TEV	OH	125	635	48	29,210
*KB7M	WY	114	580	44	25,520
N8RQ	CA	102	535	45	24,075
KR9G	IL	102	525	45	23,625
*N5FRR	LA	100	520	44	22,880
K6YK	CA	102	515	44	22,660
WA6FGV	CA	114	580	36	20,880
W8UVZ	MI	103	520	40	20,800
NN4K	GA	103	515	34	17,510
WB3TKD	NY	90	450	33	14,850
WB9LSR	WI	84	420	30	12,600
N5AF	TX	68	345	34	11,730
N9KS	WI	65	325	27	8,775
WA8MJY	MI	67	335	21	7,035
N5AFV	OK	54	270	25	6,750
W4KMS	VA	40	205	31	8,355
KE5IV	TX	44	220	24	5,280
VE7AV	BC	38	190	24	4,560
W5EIJ	AR	36	180	38	3,420
WB4AFP	SC	28	130	26	2,210
VE8XO	NWT	22	115	18	2,070

DX Single Operator

Callsign	QTH	QSOs	Points	Multipliers	Total score
**ZL1BQD	New Zealand	218	1835	75	137,625
*EA3CCN	Spain	143	1355	53	71,815
*KD7P/KH2	Guam	165	1220	50	48,800
*4U1ITU	ITU/Geneva	127	875	47	41,125
EA7ABW	Spain	60	600	25	15,000
OK1KZ	Czech.	58	540	58	11,340
OK1TN	Czech.	66	380	22	6,360
I4CSP	Italy	16	100	16	1,600

Multi-Operator

Callsign	QTH	QSOs	Points	Multipliers	Total score
**K1WW	NH	675	3685	98	380,730
*NA4L	VA	641	3695	99	365,805
*K9EC	WI	774	4110	84	345,240
*NW4B	NC	529	2950	88	259,600
*KS9O	IL	594	3170	77	244,090
*KM6U	MI	584	3025	73	220,852
KI4DC	KY	829	3175	61	193,675
*WA3SPJ	PA	505	2555	59	150,745
*WA6PVA/7	OR	393	2055	68	135,630
*N4FKF	IN	423	2115	45	95,175
*KK1B	RI	284	1450	57	82,650
*WB6RMN	CA	184	955	53	50,615
*N4JII	TN	208	1040	41	42,640

Multi-Operator Participants

K1WW	K1WW, KR1V
KK1B	KK1B, WA1ZEB
WA3SPJ	WA3SPJ + XYL
KI4DC	KI4DC, K4IRX, NO4R
N4FKF	N4FKF, KA9ORN
N4JII	N4JII, NY4N
NA4L	NA4L, N4VL, WV4N, NX4B, WD4BTF, WD4BTG, N4AKZ
NW4B	NW4B, WA4YOM, K4NYV, AA4VK, WD4DII, N4SF, W4YZC
WA6PVA	WA6PVA and ???
WB6RMN	WB6RMN and ???
KM8U	KM8U, N8AKY, KA8LDO
K9EC	K9EC, AC9C, W9WI
KS9O	KS9O, KC9XM

Check Logs: W6YMH/QRP, KL7XO, JH8TDZ, WD4MDW, and AA6EE.

regardless of how many bands or modes they are worked on. However, there will be an additional multiplier of one for each group of eight contacts with the same Kansas county for all non-Kansas stations.

AWARDS:

Certificates will be awarded to the highest-scoring station (both single and multi-operator) in each state, Canadian province, foreign country, and Kansas county. Additional certificates may be awarded at the discretion of the Contest Committee.

Worked Five Kansas BEARS Awards are also available to anyone working five club members before, during, or after the QSO Party. All QSO Party entries will be screened by the Contest Committee for possible Worked Five Kansas BEARS Awards. All Kansas BEARS Awards are administered by Mike Thornton WAØTAH, contest chairman.

ENTRIES:

Logs must show dates and times in GMT, stations worked, exchanges sent and received, bands and modes used, and scores claimed. Include a dupe sheet for entries with more than 200 QSOs. Each entry must include a signed statement that the decision of the Contest Committee will be accepted as final. No logs can be returned. Log and summary sheets are available for an SASE from the contest chairman. Entries must be postmarked no later than October 22nd and sent to: Boeing Employees' Amateur Radio Society of Wichita, c/o Mike Thornton WAØTAH, 1645 Lexington, Wichita KS 67218.

OHIO QSO PARTY
1400 GMT September 15 to 0500 GMT September 16
1300 to 1900 GMT September 16

Sponsored by the Cuyahoga Falls Amateur Radio Club, the contest is open to all radio amateurs worldwide. Each station may work a maximum of 12 hours during the contest period.

EXCHANGE:

RS(T) and state, VE province, DXCC country, or Ohio county.

SCORING:

Score 2 points for each contact with an Ohio station. Contacts with a Falls member will be worth 5 points and a contact with W8VPV, the club station, will count 25 points. Club members will identify themselves. Outside Ohio, multiply your total QSO points by the number of Ohio counties worked on all bands. Ohio stations will score 5 points for out-of-state contacts plus the member and club station bonuses. Multiply your QSO point total times the sum of states, VE provinces, and DXCC countries on each band. All stations running output power less than 5 Watts, multiply final score by 3; 5 to 200 Watts, multiply by 1.5, and over 200 Watts, by 1.

FREQUENCIES:

Phone—1890, 3900, 7230, 14230, 21360, and 28510; CW—1805, 3530, 7030, 14030, 21030, and 28010; Novice—3715, 7115, 21115, and 28115.

Club station W8VPV will be found on or near these frequencies.

AWARDS:

Plaques to the top station in Ohio and outside Ohio. Certificates to the top station in Ohio county, state, VE province, and DXCC country with two or more entries.

ENTRIES:

Mailing deadline is October 13th. Please include a summary sheet with number of contacts and multipliers, output power and signed declaration, plus total score along with log. Stations with 200 or more contacts should also include dupe sheets. Mail entries to: Anthony Luscre KA8NRC, N. Norman Dr., Stow OH 44224.

CAN-AM CONTEST
Phone
Starts: 1800 GMT September 15
Ends: 1800 GMT September 16
CW
Starts: 1800 GMT September 22
Ends: 1800 GMT September 23

Sponsored by the Ontario Contest Club and Canadian Radio Relay League, the contest is held to increase friendships among Canadian and American amateurs and to provide a means of measuring operating skills and equipment performance.

Categories of competition include (1) single operator, allband, single band, and QRP, but must be stations operated by the station licensee; (2) multi-operator, single-transmitter stations operated by more than one operator, or a single operator other than the licensee.

Multi-operator stations can operate the full 24-hour period. Single-operator stations can operate only a maximum of 20 hours with one or two rest periods totaling a minimum of four hours, which must be clearly marked in the log. Any further rest periods do not need to be logged.

Use all bands: 1.8, 3.5, 7, 14, 21, and 28 MHz with the US General portion of the bands recommended. For single-band entries, any band can be selected. All single-band entries will be judged in one category. It is up to the contestant to select the band that can bring him the highest score. For QRP entries, a maximum of 10 Watts input is allowed for use during the entire duration of the contest.

EXCHANGE:

RS(T) signal report, sequential QSO number starting with 001, plus multiplier area abbreviation—in that order. The multiplier abbreviation is the usual two-letter postal abbreviation for the 50 US states, CN for Caribbean (KC4, KG4, KP1, KP2, KS4, KV4, and their A-, N-, and W- prefix equivalents), PC for Pacific (rest of US possessions and Antarctica). Canadians will use NL—VO1 and VO2, NB—New Brunswick, NS—Nova Scotia, PE—Prince

RESULTS

WA2SPL, LC2CJ, EA3CCN, AND K9ZUH: 1984 WORLD 160-METER SSB CHAMPS

This was the year of champions on 160! New world records were set in various categories despite propagation to other parts of the world being at an all-time low. The QSO count has never been greater. Participation was at an all-time high, and the 160 World Championships continue to show steady growth year after year. In 1980 there were 569 participants, and those for the next four years, respectively, were 917, 1482, 1553, and this year, 1741.

For the single-operator class, Joe WA2SPL of New York State is the 160-Meter World Champion for 1984. With a tremendous score of 490,985 contest points, he managed 1098 QSOs, 59 states and provinces, and 24 DX countries. Joe's ability to land the far-off DX contacts made the biggest difference between his score and the well-known second-place finisher, Larry N7DF (now out of Kansas), who set a new world QSO record for the band. Apparently, Joe had a direct line to Europe, working several countries that mid-west and far-west stations couldn't. Super work, WA2SPL—typical of a true champion!

Oh, and speaking of world champions and world records, here's a glance at the QSO tally and how our contestants this year put in a big showing at the top of the list of 12 best.

N7DF	1984	1125
W9RE	1982	1118
WA2SPL	1984	1098
KC8P	1984	1048
VE3CDX	1984	1003
KØHA	1984	991
WØEJ	1984	986
W8LRL	1982	982
KØRF	1984	959
KC8JH	1984	950
WB3CGC	1982	932
KC8JH	1983	900

For the most part, everyone working 200 contacts or more managed to work all states or came within a state or two of accomplishing that. Not all Canadian provinces were represented, so it was a bit difficult to get a total sweep of the United States and Canada. WA2SPL led the pack with 59 states and provinces, followed by KC8P (58), WØEJ (58), VE1YX (58), K4JLD (58), KC8JH (57), KØHA (57), W3TS (57), N9DQS (57), N7DF (58), VE3CDX (56), K9RF (56), K7VIC (56), N8CKG (56), KX4X (56), W1RR (55), W2FCR (55), W4TMR (55), WA1UJU (55), K1LPS (55), KQ1F (55), KD4RI (54), AF1T (53), K8HHZ (53), KØSTF (52), KA7AUH (52), K1KNQ (52), VE5RA (51), WA9TZE (51), KR9G (51), WA5NFC (50), K7IDX (50), KC9FC (50).

WA2SPL amazed us all working 24 DX countries during the contest. Most of us weren't even aware there was DX on the band! Joe was followed by W1RR and VE1YX with 17 countries apiece, KC8JH (13), K8RF (8), VE3CDX (7), K7VIC (6), and N7DF, KC8P, KØHA, W2FCR, KD4NI, KA1YR, K8HHZ, K1LPS, and KA7BRE with 5 DX countries each.

For single-operator DX stations, Jorge EA3CCN of Spain is this year's World DX Champion. Jorge found the conditions to be very poor, to say the least, but his persistence finally paid him dividends. His only outlet was to work other European stations on the band—he heard only one station from the USA. Only 21 QSOs separated the champion and the second-place finisher, SP5INA of Poland.

G3XTT of England led all DX stations, working a total of 38 DX countries while he was followed closely by SP5INA of Poland who recorded 31 countries and World Champion EA3CNN of Spain with 27 DX countries earned.

With extremely poor conditions to the North American continent, Irish station EI4DW managed to lead the multiplier list by working 4 US states and Canadian provinces, while EA3CCN totaled 3.

In the multi-operator class, Jay K9ZUH (assisted by WB9PXR) of Indiana is the new 160-Meter World Champ for the W/VE category. Jay's station had 633 QSOs, 52 states and provinces, and 2 DX countries, giving him a contest total of 171,450 points. There was a difference of only 65 QSOs between Jay and the second-place staff of Kansas contestant W9CEM.

Compared with the results of years past, this year's QSO count was considerably lower. Here is the listing of the top 10 as it currently stands:

K8ND	1983	1001	W4CN	1982	804
WB8JBM	1983	897	AK2E	1982	686
W4CN	1983	690	K9ZUH	1982	677
WA2SPL	1983	879	N7DF	1983	684
W8NGO	1982	877	K9ZUH	1984	633

For DX multi-operator stations, LZ2CJ stands out considerably with 384 contacts. As the new World Champion for this category, this score and QSO count set a new 5-year record. A tip of the hat to LZ2CJ and his SWL assistant, LZ2961—Thank you both for your support.

Many have written often asking what kinds of stations are being operated by the top contenders. This year we thought we would extract that data for you from the top 5 stations (some contestants did list their equipment) and let you see for yourself:

Single Operator Class:

Call	*OTH*	*QSOs*	*St/Pr*	*DX*	*Antenna*
WA2SPL	NY	1098	59	24	Inverted vee, beverage
N7DF	KS	1125	58	5	
KC8JH	OH	950	57	13	Inverted vee
KC8P	MI	1048	58	5	Inverted vee
VE3CDX	ONT	1003	56	7	Full-wave loop, shunt-fed tower

Multi-Operator Class:

K9ZUH	IN	633	52	2	Alpha 1/4-wave vertical
W9CEM	KS	568	55	1	3-phased vertical
LZ2CJ	BU	384		37	Vertical, 4 beverages
WB9SLR	WI	519	53		
NØDKZ	CO	472	52	1	Inverted-L, KLM-160 vertical, longwire, and loop

As we said from the outset, the 5th annual event is now history. The 6th annual contest is just around the corner—scheduled for January 19-20, 1985. Obtain your contest rules and summary sheets today! Do not put it off another minute. Send an SASE to the contest chairman, Harry Arsenault K1PLR, 603 Powell Avenue, Erie PA 18505. Be sure to tell everyone on the band about this big event as it promises to be the biggest and the very best 160 contest going for single sideband. Psssst—tell the DX stations you work that a complete announcement package should appear in the November and December editions of nearly 60 foreign publications. See ya on the air with the new sloper.—*Bill Gosney KE7C.*

160-METER CONTEST SOAPBOX

AA1Q	I prefer CW to phone but this was more fun than I ever thought it would be. The best 160 contest, with lots of activity.
KW2J	To my surprise I found the contest where I expected to find CW and ended up with half the continental US in 6 hours!
WA2SPL	Biggest thrill was working OY8R. Lots of W/VE activity but it still seems DX stations didn't realize there was a contest. Contest was great however—lots of fun! (*Ed. note: we advertised in nearly 60 amateur-radio publications worldwide—most announcements appeared as early as the months of September and October! In the meantime, guess it will take some word-of-mouth info as well—can you help?*)
VE3CDX	This is my first time on 160—got on only 2 days ago.
KC7PA	Where was 1-land? Sure breaks up the winter boredom. I'll definitely be back next year.
KE7C	Lots of activity this year. Met some old friends and made many new ones. My personal thanks to all those who took time out to say hello. Your positive comments about the test are appreciated.
N8AXA/QRP	Anybody who worked me in the contest was doing pretty good. I ran 8 Watts output and had a ball.
N8CGK	There were more hams on 160 this year than I have ever heard before. Hope it stays the "gentlemen's band." Thanks for the contest; it was a blast!
NØDKZ	Best contest ever! Concerned about the DX window, however. Those who choose to observe the window properly are being penalized while those hard-to-get states are being worked between 1.825 and 1.830. By "gentlemen"? (*Ed. note: All we can do is make the window requirement part of our rules. We've done that already. Now let's enforce it. Should we require operators to circle all contacts in their logs which were made in the window? If there were more than 3 US/VE contacts made within the window it would be grounds for disqualification. Should a station fail to list the actual window frequency of a W/VE contact made there and it is found in a cross-checked log, would it be grounds for immediate disqualification? Do we really have to go to this extreme?*)
LZ2CJ	No conditions to the USA. Heard VE1YX and W1FC though!

Edward Island, SI—Sable and St. Paul Islands, PQ—VE2, ON—VE3, MB—VE4, SK—VE5, AT—VE8, BC—VE7, NW—VE8, and YU—Yukon.

SCORING:

American-to-American or Canadian-to-Canadian QSOs count 2 points each, American-to-Canadian (and vice versa) QSOs count 3 points each. The multipliers are the 50 US states, 2 US possessions (Caribbean, Pacific), 10 Canadian provinces, 2 Canadian territories (NWT, YU), and 1 Canadian island (Sable, St. Paul). With 65 multipliers per band, the maximum possible multipliers on all 6 bands is 390.

The final score is the sum of the total QSO points from all bands multiplied by the sum of the multipliers from all bands. Phone and CW sections of the contest are considered separate contests. However, combined score for phone and CW will be used for overall competition. Combined score will be calculated by the contest committee as a result of the addition of phone and CW scores.

AWARDS:

Handsome first-place certificates will be awarded in each multiplier area on both modes in single-operator category. Top five multi-operator stations in each country will receive certificates for high combined phone and CW scores. Where appropriate, the contest committee will

1984 RESULTS
160-METER WORLD SSB CHAMPIONSHIP

Indicated are callsign, QTH, QSOs, states/provinces worked, DX worked, and total score. **World champion; *Certificate winners.

W/VE Single Operator

**WA2SPL	NY	1098	59	24	490,985
*N7DF	KS	1125	56	5	344,650
*KC8JH	OH	950	57	13	337,050
*KC8P	MI	1048	58	5	331,695
*VE3CDX	ONT	1003	56	7	318,150
*KØRF	CO	959	56	8	309,760
*KØHA	NE	991	57	5	309,070
*W1RR	NH	801	55	17	302,400
*WØEJ	IA	986	58	2	296,700
*K7VIC	MT	740	56	6	231,570
*W3TS	PA	752	57	4	231,190
N8CKG	OH	749	56	4	225,900
*W2FCR	NJ	732	55	5	222,300
*W4TMR	NC	827	55	1	216,440
NØDOS	IA	705	57	3	216,600
*VE1YX	NS	496	58	17	198,000
*KX4X	AL	649	56	4	195,900
*KD4NI	VA	646	54	5	192,045
*WA1UJU	WI	644	55	0	177,100
*KA1YR	CT	564	49	5	154,980
AF1T	NH	500	53	3	141,680
*VE5RA	SASK	469	51	4	130,075
N4SF	NC	516	49	0	128,420
*K6HHZ	CA	422	53	5	124,700
*K1LPS	VT	325	55	5	99,300
*KØSTF	SD	367	52	1	97,520
N4BNO	NC	413	47	0	97,055
K4JLD	PA	368	58	0	92,000
*KQ1F	MA	327	55	0	91,575
WA9TZE	WI	337	51	2	89,835
*KA7BRE	NV	319	49	5	87,480
WB1GQR	VT	356	45	2	84,130
*WA5NFC	AR	321	50	1	82,110
N4AGS	VA	327	48	1	77,080
*KA7AUH	WA	284	52	1	76,055
KB3MI	PA	297	49	1	74,500
*KA3DRO	MD	303	49	0	74,235
K7IDX	WA	273	50	2	72,020
W3GG	MD	306	47	0	71,910
NØEKT	IA	275	52	0	71,500
*N4FNB	TN	305	45	1	70,380
K2DWI	NY	321	42	0	87,410
*W8VEN	WV	268	49	1	67,250
K1KNQ	MA	238	52	1	66,250
*KC9FC	IN	245	50	0	61,250
W3YOZ	MD	266	46	0	61,180
*WØHW	MN	247	46	0	56,810
*WB9NUL	IL	211	49	1	53,000
*K4ADI	SC	236	43	1	50,380
*N4ICS	KY	283	35	0	49,525
*KA1SR	RI	204	43	2	46,350
*N5AFV	OK	197	45	0	43,340
WG4U	KY	189	43	0	40,635
N9AKE	IL	189	43	0	40,635
KR9G	IL	144	51	0	36,720
W9VPJ	IN	162	44	0	35,640
K8GG	MI	153	46	0	34,960
*VE7ERY	BC	141	43	1	31,480
WB9IPH	IL	142	44	0	31,240
N9BWC	IL	141	40	0	28,600
WØEKS	MN	124	46	0	28,520
W4TWW	SC	145	39	0	28,275
KG9O	IL	119	41	0	24,395
W4TMN	VA	108	45	0	24,300
AI9U	IL	113	43	0	24,295
W9ZGP	IL	127	38	0	24,130
W8FGA	MI	129	37	0	23,865
W3ARK	PA	145	32	0	23,200
*N7DU	OR	121	35	1	22,320
*VE1BPY	PEI	124	33	2	22,050
VE3INQ	ONT	100	43	0	21,500
VE5XU	SASK	97	44	0	21,340
NA8W	OH	108	39	0	21,080
N4BSN	TN	116	35	0	20,300
*VE1BRA	NBRUN	130	29	0	18,850
AA1D	MA	109	32	0	17,440
*VE2QO	QUE	100	34	0	16,830
W1LOV	RI	119	28	0	16,660
N8AXA/QRP	OH	101	31	0	15,655
VE3IHB	ONT	89	34	0	15,130
*KC7PA	UT	103	29	0	14,935
K1NBN	ME	86	31	1	13,920
N8CSL	OH	81	32	0	12,960
W4KMS	VA	80	32	0	12,800
K5LZO	TX	70	36	0	12,600
W3CNS	PA	82	27	0	11,205
KV9S	IL	68	26	0	8,840
W5IRP	TX	56	30	0	8,400
KB7M	WY	57	29	0	8,265
K3OX	PA	63	26	0	7,190
KW2J	NY	50	25	0	6,250
N4UH	NC	50	24	0	6,000
VE6AHS	ALT	49	22	0	5,390
W6PFE	CA	51	18	0	4,680
N5DHF	MS	39	23	0	4,485
WB7CYO	ID	51	18	0	4,140
N9KS	WI	35	20	0	3,500
KD9ET	WI	31	17	0	2,635
AK7F	WA	31	13	0	2,080
KL7XO	AK	23	10	2	1,740
WBØBHF	IA	20	13	0	1,300
WB7THS	OR	22	8	0	880
AA6EE	CA	10	4	0	200

DX Single Operator

**EA3CCN	Spain	136	3	27	40,350
*SP5INA	Poland	115	0	31	35,650
G3XTT	England	71	0	36	25,560
OK1JDX	Czech.	68	0	14	9,520
EI4DW	Ireland	48	4	14	8,820
DJ3HJ	W. Germany	36	0	11	3,960

W/VE Multi-Operator

**K9ZUH	IN	633	52	2	171,450
*WØCEM	KS	568	55	1	159,320
*WB9SLR	WI	519	53	0	137,535
*NØDKZ	CO	472	52	1	125,345
*WA6PVA	OR	369	53	1	100,400
*WØSW	MN	328	51	0	83,640
*NN5E	TX	297	51	3	81,000
*WA1ZEB	RI	262	49	2	67,320
*KA9KDZ	IL	195	46	0	44,650
*KE7C	WA	162	48	2	41,250
*N4ARO/8	CA	161	36	3	31,980
WDØFEN	KS	129	42	0	27,090

DX Multi-Operator

LZ2CJ	Bulgaria	384	0	37	142,080

Multi-Operator Participants

WA1ZEB —WA1ZEB, KK1B
LZ2CJ —LZ2CJ, LZ2N2961 (SWL)
N4ARO/6 —N4ARO, WB6RMN
NN5E —NN5E, KC5DX
WA6PVA —WA6PVA, WA7QXH
KE7C —KE7C, KA7GBC
KA9KDZ —KA9KDZ, KB8AC
WB9SLR —WB9SLR, AJ9E
K9ZUH —K9ZUH, WB9PXR
WØCEM —WØCEM, WAØCFZ, WAØTKJ, NØCPI, WBØTOC, WBØWHB
N9DKZ —NØDKZ, NØBSA, NØEOY
WDØFEN —WDØFEN, WDØCXN, KAØPXB
WØSW —WAØNOX, WDØGUK, AIØE, WDØDTU, NØETF, KNØJ

Check log: SP8CC.

award additional awards. All scores will be published in *QST* magazine. Trophies will be awarded the combined single- and multi-operator champions in Canada and the USA.

ENTRIES:

Logs must show all times in GMT. Indicate multipliers the first time only on each band. Log must be checked for duplicate contacts, correct QSO points, and multipliers. Do not use separate logs for each band. Rest periods must be clearly marked in the log. Each entry consists of: log sheets, summary sheet showing all scoring information, category of competition, operator's name and callsign, address of the station, and signed declaration. Entries with over 200 QSOs must include check sheets for each band.

Official logs, check sheets, and summary sheets with multiplier tables are available from the contest chairman; a large SASE with Canadian stamps (or US stamps not glued to the envelope) will bring the samples. Contestants are encouraged to use them; they greatly help with the processing of the entries.

Violation of national amateur-radio regulations or rules of the contest, unsportsmanlike conduct, poor signal quality, taking credit for excessive duplicate contacts, or unverifiable QSOs or multipliers will be deemed sufficient cause for disqualification. Incorrectly logged calls will be counted as unverifiable contacts. Actions and decisions of the CAN-AM Contest Committee are official and final. All entries must be postmarked not later than 30 days after the contest and mailed to: CAN-AM Contest, Box 85, Don Mills, Ontario M3C 2R6, Canada.

MAINE QSO PARTY
Starts: 2300 GMT September 21
Ends: 2359 GMT September 23

Sponsored by the Portland Amateur Radio Association, the contest is open to all. Stations may be worked on phone, CW, and RTTY for each band.

EXCHANGE:

RS(T), serial number, and state, province, country, or Maine county.

FREQUENCIES:

SSB—1870, 3930, 7280, 14280, 21380, and 28580; CW—1810 and 80 kHz up from low end of band; RTTY—3810 and 90 kHz up from low end of band; Novice—3720, 7120, 21120, and 28120.

SCORING:

Complete QSOs count 3 points on CW, 5 on RTTY, and 1 on phone. Out-of-state stations multiply the total number of QSO points by the number of Maine counties contacted (maximum of 16). Maine stations multiply the total number of QSO points by the sum of Maine counties, states, provinces, and countries.

AWARDS:

Certificates will be awarded to top scorers. In addition, this year a trophy will be given to the highest aggregate Maine club score.

ENTRIES:

Mail entries by December 1st to PARA, Box 1805, Portland ME 04104. Applications for the Worked All Maine Counties award may go to the same address.

G-QRP-CLUB CW ACTIVITY WEEKEND
Starts: 0900 GMT September 22
Ends: 2300 GMT September 23

All radio amateurs interested in QRP are invited to take part in the club's activity weekend. No special exchange information was mentioned in the information provided by the club. The operating schedule for this last weekend is as follows:

- 3580 kHz—0900-1000, 1700-1800, and 2200-2300 GMT.
- 7030 kHz—1200-1300, 1500-1600, and 1900-2000 GMT.
- 14060 kHz—1000-1100, 1400-1500, and 2100-2200 GMT.
- 21060/28060—1100-1200, 1600-1700, and 2000-2100 GMT.

Reports on the Activity Weekend are welcomed by Christopher J. Page G4BUE, Alamosa, The Paddocks, Upper Beeding, Steyning, West Sussex BN4 3JW, England.

Full details on membership of G-QRP-Club available from the membership secretary, Fred Garratt G4HOM, 47 Tilshead Close, Druids Heath, Birmingham B14 5LT, England.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 6

might want to add ten more bits for 1,000 shades of color, too—why be limited to black-and-white pictures?

A full-page picture 10" high might have 130 lines per inch—1300 lines. Each 8" line would be made up of 130 x 8 = 1040 dots. Each dot would require four bits for dot size and ten for color—14 bits. Then we need some housekeeping bits to tell our computers when the information for a dot has started and when it has stopped—16 bits. Shall we add that all up?

1300 x 1040 = 1,352,000 dots for a full-page illustration. Sixteen bits per dot gives us 21,632,000 bits per page. If we send these at 9,600 baud (bits per second), which is very fast these days, we're talking about 2,253 seconds to send that one page—37 minutes. And we gripe at eight seconds for a slow-scan picture!

How would you like to get a magazine over the telephone that way? And 9,600 baud is the very, very top limit of that delivery system. Even a small magazine might take 82 hours. With a dedicated telephone line, you could only get two magazines a week, and think of the line cost!

So we need something with a bit more bandwidth than a telephone wire, which is about the same as a ham voice channel. We need about one thousand times the bandwidth—3 MHz—to get a magazine through in a few minutes. We can do that with microwaves, satellites, cable, or laser and fiber optics. The cable is already in place, so perhaps something can be done to send a magazine via cable. No one has invented a simple system for delivering a magazine by cable or microwave, so that would have to be developed. Someone will probably do that and make a bundle.

A good place to develop something like this is on the UHF ham bands—where 3 MHz isn't a big deal. But we're not bothering to use those bands these days, so they could be blown away soon—just as our 220-MHz band is being blown away because we refused to let the FCC test the no-code-license idea there.

Those microwave channels are desperately needed by the communications industry, and our enormous allocations are sitting there empty, with no real hope of any serious use. Of course, once they're gone, they're gone forever. 160m used to go from 1750 to 2050 kHz; now how much of it do we really have?

Hey, if you'll get hot on 3300 MHz and write some articles, I'll be delighted to print 'em and that, in turn, will get more hams interested in the band. A bit of activity on our now almost unused microwave bands could help save them—if you're game. Are you interested in saving this valuable ham resource?

When you consider the amount of spectrum that is going to be needed for communications in a few years, it's almost too much to grasp. Video conferencing is going to happen, which means that hundreds of thousands of people will be needing several megahertz each for extended periods. That's got to go via laser and fiber optics, for we don't even have enough satellite channels in prospect to handle that kind of volume.

The millions upon millions of computers around the world are going to have to be able to communicate with each other in seconds. This is going to take an elaborate network of repeaters and switching. In the early days, we may be able to make do with satellites, but eventually the volume is going to push the service into a combination of short-range microwaves and fiber optics for the longer hauls.

In the meanwhile, we sit at our ham rigs, trusty key in hand, keeping alive the memory of good old Sam Morse—whose invention was rendered obsolete in 1876 when Bell used his new intercom system to call Watson. I think it is kind of nice to have this living memorial to a quaint old technology—a hundred years old. We're keeping alive some Americana.

In line with that thought, is it really honest to use those newfangled speed keys? I won't even bother to comment on cretins who use electronic keys or those damned typewriter abominations. The old straight key lets the operator's personality come through, right? J-38 forever!

Old timers will remember when hams had a wide range of microwave channels which could be used via satellites. We lost them at the ITU. The League represented us at the conference and you'll find the sorry report in the fine print in *QST*. As Daniels, who was president at the time, said, we didn't do our homework. We lost about 99.99% of our satellite allocations at that time and 100% of our opportunity to ever keep up with technology.

This aggravates me a bit. We're looking at probably a 5% loss of hams this year instead of growth, and our drop in the entry of youngsters is on the order of 80%. The *73* readers who teach school tell me that the kids today are too smart to fall for the Morse-code ploy. Lots of them would like to try ham radio, but their intelligence is offended by the code requirement.

Fortunately for us, the Japanese got rid of the code about twenty years ago, so we'll have the hundreds of thousands of very-well-paid Japanese engineers and technicians it will take to provide our coming communications needs. Their young hams are hard at it, inventing new circuits; you should see their ham magazines—five to six times as thick as anything we have and packed with construction articles every month.

Hey, if you'd like to see for yourself, join me in October (there's just time to get your visas) for a trip to Japan and see their incredible Consumer Electronics Show. The trip, which includes stops at the electronics shows in Taipei, Hong Kong, and Korea, costs about $2,500 and is first class. Drop me a line. I try to get to these shows as well as the two American shows every year so I know what's happening worldwide.

The American shows are

$$ HOME-BREW III $$

Turn your hot solder into cold cash! Once again, *73* is searching for the greatest home-brewer in the land. All projects have a chance to appear in *73*, and the best of the best will be showered with fame and fortune.

Top prize is $250. Second place is worth $100, and three runners-up will each earn $50. Of course, this is in addition to the payment every author receives for publishing in *73*.

Contest Rules

1. Entries must be received by November 1, 1984.
2. To enter, write an article describing your best home-brew construction project and submit it to *73*. If you haven't written for *73* before, please send an SASE for a copy of our author's guide.
3. Here's the catch: The total cost of your project must be $73 or less, even if all parts were bought new. Be sure to include a detailed parts list with prices and sources.
4. Our technical staff will evaluate each project on the basis of originality, usefulness, reproducibility, economy of design, and clarity of presentation. The decision of the judges is final.
5. All projects must be original, that is, not previously published elsewhere. There is no limit to the number of projects you may enter.
6. All rights to articles purchased for publication become the property of *73*.
7. Mail your entries to:

73 Magazine
Editorial Offices
80 Pine Street
Peterborough NH 03458
Attn: Home-Brew III

rgely Japanese these days, ne same firms, in all probabil-y, which will be taking over our ommunications: Hitachi, Mat-ushita, Mitsubishi, Toshiba, ony, NEC.

Of course, if there were some vay to get American teenagers nterested in amateur radio ather than popping, snorting, smoking, and sniffing drugs, drinking, watching TV, and other otal wastes of time and money, we might stand a chance. The kids are not going to go for the Morse code—forget that—so do you have any other ideas? I'm stymied.

Kids are not career-oriented enough to spend time doing something or learning something for that reason. They'll work hard at learning if they perceive it as fun and there is an immediate goal which makes sense to them—a goal such as a hobby. None of us who started amateur radio in our teens had any idea of a career; we did it because it was fun and then later found that our hobby just naturally was one hell of a great career bonus. Tomorrow doesn't exist for most kids; why else would so many millions drop out of school? Thus any appeal we may want to make to kids has to be as much on an immediate-reward basis as possible.

You know, if it took two days for pot to work, kids wouldn't bother with it. This immediate-gratification syndrome really has to be reckoned with. We have to understand that kids today just are not brought up to be rewarded next week for work today, so they haven't any patience with taking weeks to learn the code so they can get on the air in an eon or two.

This is a natural response for kids, so we shouldn't be surprised. I suspect that a couple of generations ago, when the radio was blaring fourteen hours a day in homes instead of the TV, perhaps we taught kids the benefits of patience. Now, with the parental eyes and attention on "Dallas" and "Falcon Crest," most kids are brought up with little more than their natural inclinations to guide them, no matter how destructive.

If you had no fear of addiction, mightn't you try cocaine and heroin? Well, when tomorrow isn't real, addiction isn't real, so what's the worry?

Perhaps, as the editor of a ham magazine, I hear a lot more than you do from people who have tried (some for years) to learn the code. Some have dyslexia, some have trouble getting the two sides of their brain to cooperate—and the learning of the code is an incredibly complex use of the brain. Some people can learn the code in a few minutes—it took me less than a half hour to learn the characters and just a few hours of practice to get to 13 per. Things like that are easy for me. Yet I've known several people who wanted ham licenses so bad they would almost have killed for them and yet they never were able to manage the code.

Despite the irrelevancy of amateur radio today, we've managed to hold our low bands pretty well. I'd chalk that up more to bureaucratic bungling and the virtual death of the American consumer electronics industry, which is the group that normally would be fighting for our frequencies. If they were alive, they'd be grabbing for our bands in a minute and we'd have little argument to stop them—and less power. There are less active amateurs today than owners of Timex computers.

So, as I turn on my rig to see if Eva has her list all set for another DXpedition, I know that it's likely that I'll be able to ham for a few more years. Who knows, perhaps satellites and fiber optics will save our low bands and even take the pressure off some microwave bands. But the growing number of mobile services are going to take all of the old television channels and more as TV is moved to fiber-optic cable or direct-broadcasting satellites.

People walking or driving around are going to want to communicate. We know that from the ham use of repeaters. It's rare these days to see a ham without at least one HT on his belt and at Dayton some have a half dozen dangling. Many groups bring their own repeaters to Dayton—heaven forbid they should lose contact with members of the club somewhere out in the flea market.

We see the beginnings of this with cellular radio. If I can talk with someone a hundred miles away while skiing down a mountain in Colorado or New Hampshire (and I've been doing that for 15 years now), you can bet that the businessman is going to make sure that he can do at least that. It'll take a while to organize—it will require a lot of channels and it will sell an incredible amount of Japanese equipment.

Yes, I see this coming and it is frustrating. The League won out on the Morse code, so now I don't know of any way to get ham clubs started in high schools. They have them in every high school in Japan, as you already know. And, yes, I know that a good many hams won't agree with me, but I'll bet none of 'em will be specific about where they disagree.

On the code? We have as clear proof as anyone could ask for in the Japanese example of what happens when you eliminate the code test. They have licensed about one and a quarter million hams so far. Oh, yes, the Japanese are different. Yep, I've heard that. Well, it's true, apparently. IQ tests seem to indicate that they have an intelligence lead on us of about ten points on the average, according to the scientific reports. They sure seem to have done the smart thing in eliminating the code from the ham exams.

I'm writing this editorial on a Radio Shack computer, designed and made in Japan. I print it out on a C. Itoh printer, designed and made in Japan. I am wearing a Seiko UC-2000 computer watch, designed and made in Japan. MY CD player in the corner is by Sony, designed and made in Japan. My hi-fi and TV sets are by Hitachi, designed and made in Japan. My ham rig is a Kenwood, and you know who designs and makes all our ham gear as well as I do. None of these is a copy of an American invention; they are all creative developments and most of them were done by Japanese who started out as hams in high school a few years ago while we were killing ourselves off with the Morse code.

Anyone out there game to petition the FCC to reconsider their mistake with the no-code proposition?

NEW TECHNOLOGY

Let me see some hands: How many of you know about Compact Discs—CDs? These were probably the biggest hit of the recent Summer Consumer Electronics Show in Chicago. These are the first digital audio recording medium and once you hear a CD, you will be all through buying LP records. The difference is that great. I've been enough impressed with the difference to

See List of Advertisers on page 98

get a magazine started to support this new industry—*Digital Audio.*

But the CD has even more prospects than as a whole new start for hi-fi. We'll be seeing these discs used for data storage for computers and even as low-cost interactive video players. The material is stored digitally on the disc and then read with a laser beam, so there's no wear on the record no matter how many times it is played.

Interactive video is the best delivery system we've yet found for reducing the cost and improving the quality of education. I attended a symposium on the subject recently at Dartmouth and enthusiasm is high in the educational community for the interactive video disc potential. Maybe I should start a magazine, eh? Not yet.

If you're an entrepreneur and want to know what technology is going to explode next, I'll tell you. There are opportunities for hundreds of small firms to get started with products in this new field and make millions. This is the briefcase, lap, or kneetop computer. Businessmen all have to do homework. It won't take long before they discover that these small computers will help them enormously to write, do business plans, schedule, work on spread sheets, communicate, and so on. I predict that within two years there will be more of these small computers sold than desktops.

These computers need software, accessories, small printers, and information just like the desktop computers did. In a couple of years, most of the businessmen you know will have one or even two. I already carry around two most of the time—they do slightly different things. I use 'em in the car, on planes, and when I have a few minutes to wait for someone. Most of you have been ignoring my exhortations for you to get into business and make money for years, so I'm used to it. But I do get a lot of pleasure when someone says hello at a hamfest or other show and claims my editorials got them off dead center and helped make them rich. I can put up with an awful lot of old hams (poor hams, I should add) grumbling about not agreeing with me when I hear that now and then.

WAYNE GREEN ALUMNI REUNION

If you know anyone who has worked for me over the last 24 years, have them get in touch. I'm organizing a special dinner meeting at the November Comdex in Las Vegas so we can get together for a reunion. Hey, next year is the 25th anniversary for *73.* Not many magazines survive that long.

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

ON THE ROAD AGAIN

Now that the FUN! poll tabulations are completed, we can get back to the business at hand. Now, where was I? Oh, yeah. EPCOT Center. I visited Walt's final brainstorm last April while in Florida to cover a space-shuttle launch for another magazine.

You would think that Mr. FUN! would have fun at a place like EPCOT, right? Well, I did—in a way. I couldn't stop laughing at all of the stupid exhibits. Experimental Prototype Community of Tomorrow? Only if Kodak, GM, and AT&T decide to rework our neighborhoods. Frankly, the place is nothing but a big trade show glopped with the usual Disney hokum. The food at the various restaurants was good, but the rest of my visit was a waste.

Now, don't get me wrong. I'm not against big business. I like money as much as anyone (perhaps more so), but I just can't see how EPCOT is going to help us change the world. It may show us the glories of a few multinational corporations, but it'll take a lot more than a 3-D movie and some talking dummies to lead us into the third wave. Anyway, how can you take the place seriously when its communications exhibit includes a revolving cover of *CQ Magazine*? Really! Take my word; stay away.

My spring travels also took me to Washington DC and the Smithsonian's revamped Museum of American History. Make a note to hit this place the next time you visit Disney World by the Potomac. The displays of early radio, telegraph, and computer equipment are superb and bound to thrill any red-blooded ham. Sadly, NN3SI, the Smithsonian's ham station, was unattended the day I visited. Quite a pity. It was a Saturday and the place was loaded with spring tourists. C'mon guys, let's get our act together. If I had had my ticket with me, I would have sought someone out for permission to operate.

This month's column is about nothing in particular—just some random quizzes on random topics.

ELEMENT 1 MULTIPLE CHOICE

1) By now we all should know that Hiram Percy Maxim W1AW was a founder of the American Radio Relay League, back in 1914. But who was the League's co-founder?
   1) Herbert Hoover
   2) Clarence Tuska
   3) Franklin Gothic
   4) Urban Hewitt

2) What were the official Conelrad frequencies?
   1) 14.090 and 21.090 MHz
   2) 540 and 880 kHz
   3) 640 and 1240 kHz
   4) 710 and 1600 kHz

3) The word "Conelrad" stands for:
   1) Consolidated emergency limited radio system
   2) Connected electronic radios
   3) Control of electromagnetic radiation
   4) Consolidated electronic radiation network

4) You'll find the "Graveyard" on:
   1) 20 meters
   2) 11 meters
   3) 160 meters
   4) the AM broadcast band

5) Radio Peace and Progress broadcasts from:
   1) The United States
   2) China
   3) The Soviet Union
   4) Taiwan

ELEMENT 2 SCRAMBLED WORDS

Unscramble these terms related to shortwave listening:

tactis	arlye	golrnef
breactila	saeservo	renegein
granpopada	tenrenvomg	gaugelan
tralveni	loseglurl	micus
telnis	gorparm	domsecti
dbna	licensetand	plisrotac
drabsocat	luitities	

ELEMENT 3 TRUE-FALSE

	True	False
1) Howard Hughes was a ham.	____	____
2) Andy Devine was a ham.	____	____
3) Harry Truman was a ham.	____	____
4) The first Dayton Hamvention was held in Columbus.	____	____
5) The FCC allows W1AW to use up to 10,000 Watts of power during code-practice sessions.	____	____
6) The planet Jupiter can be heard on 21 MHz.	____	____
7) SINPO is a system used to determine a received signal's quality.	____	____
8) The Voice of America is operated by a private company.	____	____
9) The electrical term "siemens" used to be known as "mho."	____	____
10) A triode has two elements.	____	____

ELEMENT 4 ALPHABET GAME

Complete the words below by placing letters of the alphabet on each dash. Use each letter only once.

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z

1) _OULE
2) _O_
3) _IP_LE
4) SC_E_AT_C
5) _I_O_AT_
6) PERM_A_ILIT_
7) _U_ERRE_ENER_TIVE
8) _RE___EN_Y
9) _E_E_

THE ANSWERS

Element 1:
1—2 But HPM got all the publicity.
2—2 So it says on the radio in my '62 Chevy Impala convertible. Nice car. Dated radio.
3—3 In theory, it was supposed to keep enemy aircraft from zeroing in on a town or city.
4—4 At the upper end of the band, where the FCC lumps low-powered broadcasters.
5—3 Yeah, right.

Element 2:
(Reading from left to right): static, relay, foreign; calibrate, overseas, engineer; propaganda, government, language; interval, religious, music; listen, program, domestic; band, clandestine, tropicals; broadcast, utilities.

Element 3:
1—True 6—True
2—True 7—True
3—False 8—False
4—False 9—True
5—False 10—False

Element 4:
1—JOULE
2—VOX
3—DIPOLE
4—SCHEMATIC
5—KILOWATT
6—PERMEABILITY
7—SUPERREGENERATIVE
8—FREQUENCY
9—ZENER

SCORING

Element 1:
Five points for each correct answer.
Element 2:
One point for each unscrambled word.
Element 3:
Two and one-half points for each correct answer.
Element 4:
Two and one-half points for each word completed.

How did you do?
1-20 points—Amazing. You can read!
21-40 points—Not good
41-60 points—Not bad
61-80 points—Pretty good
81-100 points—Want to take over the column?

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EMERGENCY COMMUNICATIONS—An Organizational and Operational Handbook, by K3PUR. A complete reference guide for ARES/RACES and other public service groups, as reviewed in December '83 *QST* and January '84 *CQ*. $9.95 plus $1.50 P/H to: FDW Arts, 1394 Old Quincy Lane, Reston VA 22090 (VA residents, add 4% tax). BNB089

DX HEADING MAPS for Boston, NYC, Philadelphia, Baltimore, Detroit, Atlanta, Chicago, New Orleans, St. Louis, Dallas, LA. 11"×17", $1.75 pp. 22"×34", $5.95 pp. Specify city. Massey, PO Box 397, Hainesport NJ 08036; (609)-261-2952. BNB094

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DIGITAL AUTOMATIC DISPLAYS for FT-101s, TS-520s, Collins, Drake, Swan, Heath, and others. Six 1/2" digits. Write for information. Grand Systems Dept. A, PO Box 3377, Blaine WA 98230; (604)-530-4551. BNB183

COMMODORE HARDWARE: VIC-20 or C-64 RTTY/CW interface with programs (specify tape or disk): bare board $15.00, complete unit $85.00. Cassette interface, use instead of datacassette: bare board $5.00, complete $15.00. Bob Koerber KA7KBC, 7019 Jeanne Rd., Lemon Grove CA 92045; (619)-462-9443. BNB184

ICOM IC-4AT with professionally-installed Commspec PL™ board: $320. Andy DeMartini KC2FF, 1631 Gulf Blvd., Clearwater FL 33515; (813)-596-2654. BNB185

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GE TPL TRANSCEIVER on six FM, mobile, 50 W, manual, $110. CIE electronic course, $30. Bill KA7DTN, 2016 Fox Hill, Flagstaff AZ 86001; (602)-526-3298. BNB189

NOT LIKE OTHER SOUND CHIPS. These are true state of the art. The best available. New unique multi-instrument CMOS multi-melody custom ICs. No other source. Low cost. Discounts up to 85%. Special inventory offer. SASE brings free flyer. K. Boufal, Electronics Consultant, 244 Fitzwater Street, Philadelphia PA 19147. BNB190

VIC-20/C-64 budget-priced interface/software for full CW rcv/xmt. Features LED tuning, programmable message buffers, large type-ahead buffer and more. Works with any rig. Specify computer and disk or cassette: $39.50. Paul Rosenkranz N5FQN, Route 4, Box 24D, Taylor TX 76574. BNB191

AMATEUR RADIO'S NEWSPAPER—*WORLDRADIO*. Latest info. One-year subscription (12 issues) only $10. *Worldradio*, 2120-C 28th St., Sacramento CA 95818. BNB192

PACKETEERS—Tandy model-100 briefcase computer, 32K ROM, 32K RAM, RS-232 cable, telephone cable, transformer, manual, and technical manual: $750. Bill Echols WA2NYR/4, 4667 North View Road NW, Kennesaw GA 30144; (404)-928-8510. BNB193

RCA VOLT-OHMS WV97A $30, WV77C $20. Old HRO coil set $70. Beckman pH

meter $25. K6KZT, 2255 Alexander, Los Osos CA 93402. BNB194

ANTENNAS WANTED: We pay cash for surplus amateur and CB antennas. Must be in original boxes and in reasonably good condition. Send a list or call: H. C. Van Valzah Co., 1140 Hickory Trail, Downers Grove IL 60515. BNB195

SALE—COMPLETE OPERATING STATION —Mint Drake R4B-T4X, power supply, switching console with phone patch, filtered pair 813s 10-80 linear, 3-kV power supply, all cables, relays, manuals: $800. W2ETB; (212)-833-0139. BNB196

NEW HAM-SWL SOCIETY for unity of thought & learning. Open to all. Many topics, awards, free ad space in periodical, society net, museum participation. Shack pics & QSLs welcome. Writers needed. SASE for info to RCSW, 32 Applegate, Bennington VT 05201. BNB197

KT5S SUPER DX SLOPER 80-10m only $59.95. KT5B multiband dipole 160-10m only $59.95. 2-kW roller inductor (28 uH) $47.50. Weather-boot kit (PL-259) $8.95 p.p. Much more! Info available. Kilo-Tec, PO Box 1001, Oak View CA 93022; (805)-646-9645. BNB198

WANTED: E.H. SCOTT RADIO—1935/1940 vintage. Either 23-tube All-Wave or Philharmonic. Must be in excellent condition. Will pay shipping charges. J. Fred Belles, 8563 Peebles Road, Pittsburgh PA 15237. BNB199

COLOR COMPUTER OWNERS—Free software and hardware catalog. Spectrum Projects, PO Box 9866, San Jose CA 95157-0866. BNB200

ROHN TOWERS—wholesale direct to users. 23% to 34% discount from dealer price. All products available. Write or call for price list. Also we are wholesale distributors for Antenna Specialists, Regency, Hy-Gain. Hill Radio, 2503 G.E. Road, PO Box 1405, Bloomington IL 61701-0887; (309)-663-2141. BNB201

FANTASTIC DISCOUNTS—Icom, Kenwood, Yaesu, Sony, MFJ, Panasonic, Uniden, Bearcat, Regency, antennas, coax, CW/RTTY decoders, marine, more!! Free UPS shipping & insurance to 48 states. 25-page picture catalog $1.00 (refundable). Galaxy Electronics, Box 1202 67 Eber Ave., Akron OH 44309; (216)-376-2402 9-5 pm EST. BNB202

IT PAYS TO ADVERTISE IN 73

✓ *See List of Advertisers on page 98*

SATELLITES

SPACE-SHUTTLE COMMENTARY

The Spaceport Amateur Repeater Club (SPARC) has been authorized by AMSAT to transmit space-shuttle-mission commentary for all missions on Special Services Channel H2 (145.963 MHz) of AMSAT-OSCAR 10. SPARC, through the facilities of K4GCC and WB4ZXS, will provide space-shuttle-mission audio for several hours each as time permits. All amateur-radio operators are invited to submit reception reports to: SPARC, PO Box 872, Merritt Island FL 32952. (de Carl AA4MI)

HAM IN SPACE—TAKE 3

Yet another amateur has been chosen by NASA for the space-shuttle program. This time it's Dr. Ron Parise WA4SIR. Ron's contract calls for at least two missions, the first being 61F scheduled to fly in March, 1986. Ron is very active in AMSAT and has been science coordinator for the UO-9 project. Regarding amateur-radio operation from the shuttle, Ron says he is "enthusiastic" and looks forward to bringing some radios aboard. Possible follow-up flights may include missions in November, 1988, and July, 1987.

SPACE TRAFFIC CONTROL

AMSAT may soon need to sponsor a permanent ham in space just to direct traffic. Plans for the next year or so call for several new satellites including Phase IIIC, ARSENNE, JAS-1, PACSAT, and hopefully a parasitic geosynchronous system. Add these to the birds already orbiting (OSCARs 9, 10, 11, and six RS-series) and we've made quite a contribution to the already-present congestion. Any volunteers?

TIMELY INFORMATION

Up-to-date information on all aspects of satellite operation may be obtained by tuning in to one of AMSAT's information nets. Times are in UTC and frequencies are in kHz:
0200 Tuesday on 3850
1900 Sunday on 14282
1800 Sunday on 21280
0300 Wednesday on 3850
0400 Wednesday on 3850

You may also receive late-breaking news by copying the ARRL bulletin. For a complete schedule of ARRL transmissions, send an SASE to the League at 225 Main Street, Newington CT 06111.

Thanks to *Amateur Satellite Report* for this month's information.

RS-5 UTC	RS-5 EQX	RS-6 UTC	RS-6 EQX	RS-7 UTC	RS-7 EQX	RS-8 UTC	RS-8 EQX	Date
0009	244	0000	248	0025	249	0146	263	1
0003	244	0143	275	0015	248	0143	264	2
0158	275	0128	273	0005	247	0140	265	3
0152	275	0112	271	0155	276	0138	265	4
0147	275	0057	268	0145	275	0135	266	5
0142	275	0042	266	0135	274	0132	267	6
0136	275	0026	264	0126	273	0129	268	7
0131	276	0011	262	0116	272	0126	269	8
0125	276	0154	289	0106	272	0123	269	9
0120	276	0139	287	0057	271	0121	270	10
0115	276	0123	284	0047	270	0118	271	11
0109	276	0108	282	0038	269	0115	272	12
0104	277	0053	280	0028	268	0112	273	13
0059	277	0037	277	0018	267	0109	274	14
0053	277	0022	275	0009	266	0106	274	15
0048	277	0006	273	0158	295	0104	275	16
0043	277	0150	300	0148	294	0101	276	17
0037	277	0134	298	0139	293	0058	277	18
0032	278	0119	295	0129	293	0055	278	19
0027	278	0103	293	0119	292	0052	278	20
0021	278	0048	291	0110	291	0049	279	21
0016	278	0033	288	0100	290	0047	280	22
0011	278	0017	286	0050	289	0044	281	23
0005	279	0002	284	0041	288	0041	282	24
0000	279	0145	311	0031	287	0038	283	25
0154	309	0130	309	0022	286	0035	283	26
0149	309	0114	307	0012	285	0032	284	27
0144	309	0059	304	0002	285	0030	285	28
0138	310	0043	302	0152	314	0027	286	29
0133	310	0028	300	0142	313	0024	287	30
0128	310	0013	297	0132	312	0021	287	1
0122	310	0156	325	0123	311	0018	288	2
0117	310	0140	322	0113	310	0015	289	3
0111	311	0125	320	0103	309	0013	290	4
0106	311	0110	318	0054	308	0010	291	5
0101	311	0054	315	0044	307	0007	292	6

AWARDS

SUBMARINERS

The DuPage Amateur Radio Club will be operating a special-event station, W9DUP, in honor of the 30th annual convention of the US Submarine Veterans of World War Two from Wednesday, August 29, through Saturday, September 1, 1984, from the submarine *USS Silversides* which is docked as a War Museum alongside Navy Pier in Chicago.

Hours of operation will be from 1100 to 0300 UTC daily on 10 through 80 meters and also two meters. For a commemorative certificate send $1.00 and a #10 SASE to DARC, PO Box 71, Clarendon Hills IL 80515.

WINO AT WORLD'S FAIR

The Wireless Institute of New Orleans (WINO) will be operating a special-event station at the Louisiana World Exposition on August 31 and September 1. The "Wonderful WINO Weekend at the World's Fair" will enable hams around the world to contact the World's Fair amateur radio station, K5WF, on the Friday and Saturday nights preceding Labor Day, from 10:00 pm CDT until 2:00 am CDT.

Contacts will be on the forty-meter band, LSB, on or near 7.240 MHz. Propagation permitting, K5WF will also be on 75 and 20 meters.

Special commemorative QSL/Certificates confirming contacts will be available for an SASE to: WINO, Box 6541, New Orleans LA 70174.

LAKE COUNTY ARS

The Lake County Amateur Radio Society will have a special-event station, N6GJM, at the Lake County Fairgrounds on August 31 through September 3, 10:00 am to 10:00 pm PDST.

Operating frequencies will be 10 to 20 kHz above the bottom portion of CW and phone bands, 15 through 80 meters.

A special certificate is available for an SASE to KR8G, PO Box 682, Cobb CA 95426.

OK CORRAL, TOMBSTONE, COCHISE COUNTY, ARIZONA

A special-event station will again operate from the heart of the OK Corral, in conjunction with the third annual Rendezvous of The Gunfighters, September 1, 2, and 3, 1984.

The OK Corral was the site of the famous shoot-out between the Earp and Clanton factions in 1881. Operations, cosponsored by KB7KZ and the Old Pueblo Radio Club will begin at 1500 UTC, September 1, and run through 2200 UTC, September 3, on CW and SSB. Frequencies: SSB—28880, 21380, 14280, 7280; CW—21130, 7130.

A certificate will be awarded to all who work us as well as SWLs. Please send a large 8-1/2" × 11" SASE (40 cents postage) to: KB7KZ, PO Box 36032, Tucson AZ 85740.

LOCOMOTIVE MOBILE

The Northern New Mexico Amateur Radio Club will hold its 2nd annual steam-locomotive mobile operation on the Cumbres and Toltec Railroad, September 8, 1984, de 1000 MST to 1630 MST. Frequencies of operation will be 14.225 MHz and 7.225 MHz. The train will travel from Antonito CO to Osier CO and back, crossing the NM and CO border 10 times. If you wish to join us, contact Daryl Grant W7LHO, 1885 Camino Lumbre, Santa Fe NM 87502.

HONORING BEAR BRYANT

The West Alabama Amateur Radio Society (WAARS) will operate the 2nd annual special-event station on Saturday, September 8, in commemoration of the greatest college football coach in history, Paul "Bear" Bryant.

The Bear Bryant special-event station will operate from the campus of the University of Alabama. WAARS will operate using the callsign KE4TN from 1300Z to 2400Z on that date.

Phone frequencies will be the bottom 25 kHz on the General 40-10-meter phone band. The club will also work Novices on the bottom 25 kHz of the Novice band. The club will offer a handsome commemorative certificate of the event to any station worked. Send $1 and a large SASE to the West Alabama ARS, PO Box 1741, Tuscaloosa AL 35403.

MARK TWAIN ARA

The Mark Twain ARA will operate W0KEM from 1400Z to 2300Z on September 8th and 9th to celebrate the dedication of the 20,000-acre Mark Twain Lake and Clarence Cannon Dam in east-central Missouri.

Phone operation will be in the lower 25 kHz of the 40-, 20-, and 15-meter General bands, also Novice operation in the 40-meter band. For certificate send a legal-size SASE to Mark Twain ARA, PO Box 56, Center MO 63436-0056.

OCEAN MONMOUTH ARC

Ocean Monmouth Amateur Radio Club (OMARC) will operate KC2Q from 1600Z on September 22, 1984, until 1600Z September 23, 1984, from the Guglielmo Marconi Memorial Tower which was used during early transoceanic receiving experiments. Frequencies: 3.965, 7.265, 14.265, 21.365, 28.565. For a QSL send an SASE, or for a certificate and a QSL send $1.00 to KN2B, 18 Gardners Lane, Manasquan NJ 08736.

PAUL BUNYAN FESTIVAL

The Paul Bunyan Wireless Association and the Brainerd Area Amateur Radio Club will be sponsoring a special-event station from the site of the Paul Bunyan Festival near Brainerd MN. Operation will be from 1800Z on September 22, until 2100Z on September 23. Operation will be in the lower portions of the General-class phone bands of 40-10 meters. For a commemorative QSL, send QSL and SASE to Rick Paine KC0YG, PO Box 354, Pequot Lakes MN 56472.

MOUNTAIN STATE AWARD

The Logan County ARC will hold its fourth annual Mountain State Award expedition from 1600 UTC on September 22, until 0200 UTC September 23, 1984. The callsign will be W8VEN.

Phone operating frequencies will be approximately 25 kHz from the low end of the General phone 80- and 40-meter bands as propagation allows.

A handsome 8" × 10" certificate will be awarded to all contacts submitting a QSL and legal-size SASE to Robert T. Johnson W8VEN, PO Box 320, Stollings WV 25646.

DR. DIGITAL

Robert Swirsky AF2M
PO Box 122
Cedarhurst NY 11516

MAILBAG

Every so often, I look through the letters I receive. It always amazes me to see all the silly things I am asked to do—debug programs, design hardware, or write software. Today, I got what is by far the most interesting letter. It reads:

Dear Dr. Digital,

I never thought I'd be writing to you, but the problem persists. In the cold of winter, they freeze over and I can't do a thing with them; in the summer, they curl up and wrinkle. Please, Dr. Digital, I need help. My digits bother me so.

Besides all that—other people place *their* digits on top of mine! Really, Doctor, can't anything be done? They, of course say (mumble) "Excuse me," "S'cuse me," or "S'rry," but my digits ache anyway.

HELP!

Unfortunately, the letter had no signature or return address, so I'll have to reply in the column:

Dear Friend,

I think I have a solution to your problem that will reduce your digital problems by twenty percent *and* make you a better computer programmer.

My idea is this: Have two of your fingers removed. This way there will be fewer fingers to give you grief. In addition, you'll be a whiz with octal (base 8) notation. If you program in assembly language, base 8 will come in handy.

Your Friend,
Dr. Digital

REAL PROGRAMMERS

Are you a real programmer? There has been much written on what separates the real hams from the appliance operators, but not on how to tell the real programmers from the hackers. I offer the following guidelines. See how many *you* follow. Real programmers...

- Use FORTRAN II
- Use Intel Mnemonics for Z-80 work
- Never use comments
- Can read paper tape
- Use obscure tricks
- Use DSEGs
- *Understand* the USING directive
- Can get out of Witt's End
- Prefer TECO or CP/M ED
- Know RSX-11M
- Never upgraded their computers from CP/M 1.4
- Don't sign licensing agreements
- Program in uppercase
- Slash the letter "O" and not the number zero
- Use 8" SSSD floppy disks
- Program off the front panel
- Feel PL/M is too high level
- Play TOPS-10 Adventure, Lunar Lander, and nothing else
- Use Dijkstra's picture for a dartboard
- Call by name
- Program for fun
- Have an autographed picture of Knuth
- Take their work home
- Are usually poor

WE INTERRUPT THIS PROGRAM...

For the past few months, I've been discussing some ways computers are interfaced to external equipment, such as amateur-radio hardware. This month, I will continue the discussion with a description of interrupts.

If you've written programs of any sizable length, you have probably divided your code into subroutines. A subroutine is a section of code that is to be executed a number of times during a program's execution. It is invoked by a statement such as CALL, GOSUB, or JSR. For example, in 6502 assembly language, a subroutine call looks like this:

```
JSR SUB1
```

When this statement is executed, a number of things happen. First, the content of the program counter is stored in a special memory location called the stack. The program counter is a special register within the microprocessor that contains the address of the *next* instruction to be executed. After this is done, the address of the subroutine "SUB1" is loaded into the program counter. This causes the computer to branch to the subroutine.

After the subroutine is finished, program execution returns to the statement after the calling JSR. In 6502 assembly language, this is accomplished with the RTS (return from subroutine) statement. For example, subroutine SUB1 might look like this:

```
SUB1  CLC
      LDA #03
      ADC #99
      STA XYZ1
      RTS
```

The RTS essentially "undoes" the JSR statement. It takes the value of the program counter that was stored on the stack by the JSR statement and loads it back into the program counter. This causes the computer to resume program execution at the statement after the JSR Because of the way that the contents of the program counter are stored, the subroutine can be called from any part of the main program and it will be able to return control to the main program.

Now that we have the concept of a subroutine out of the way, we can begin to look at interrupts. An interrupt is similar to a subroutine except that an external event, not a program call, causes it to begin execution.

Suppose you are using a computer to control a RTTY mailbox station that uses telephone lines for control purposes, such as turning the system on and off. One way of writing the software for the computer controller is to have it check the phone line every so often to see if a call is coming in. This would require a software branch to the telephone-checking subroutine as often as possible. This method is called "polling." The hardware that interfaces the computer to the telephone line is polled (examined) every so often to see if a call is coming in. Polling can waste a great deal of time, as well as slow the rest of the program down.

A much better way of doing this is to use interrupts. Every microprocessor has an interrupt input line of some form. If the telephone-interface hardware was connected to the interrupt line on the microprocessor, it would cause an interrupt routine to be executed. An interrupt routine resembles a subroutine. In 6502 assembly language, an interrupt routine might look like this:

```
INT   LDA #00
      STA TURNOFF ;turn transmitter off
      RTI
```

The STA statement stores a zero in a memory location that causes our hypothetical transmitter to shut off. Notice that the interrupt routine ends in an RTI instruction instead of an RTS instruction. This is because an interrupt request causes the status register to be saved on the stack in addition to the program counter. The RTI statement restores both the status register and the program counter to their original states. This way, the main program can resume execution as if nothing happened.

On the 6502 microprocessor, there are two interrupt connections, IRQ and NMI. The IRQ is a *maskable* interrupt, and the NMI is *non-maskable*. A maskable interrupt is an interrupt that can be disabled by setting a special bit in the status register. When this bit is set, the maskable interrupt (IRQ) is ignored. The NMI interrupt is always acted upon; it cannot be masked.

How does the computer know where to branch when an interrupt occurs? In the 6502, there are a number of special locations called interrupt vectors. These locations contain the addresses that the interrupt service routines start at. The vector location for the IRQ interrupt is hex locations FFFE and FFFF; the NMI vector is at FFFA and FFFB.

Next month, we'll explore interrupts further. On some of the newer processors, such as the 8086 and the 68000, interrupts are extremely complex. If one masters the use of microprocessor interrupts, one can design much more efficient computer-controlled devices.

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine *by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices,* 73 Magazine, *Pine St., Peterborough NH 03458.*

BUFFALO NY
SEP 7-8

Ham-O-Rama and Computerfest 1984 will be held on Friday and Saturday, September 7-8, 1984, at the Erie County Fairgrounds (Buffalo Raceway, south of Buffalo NY). The hours on Friday are 6:00 pm to 9:00 pm and on Saturday 7:00 am to 5:00 pm. Admission is $4.50. Flea-market vendors' fees are $10.00 for indoor space and $3.00 for outdoor space. Features will include new equipment and video displays, computer demonstrations, technical and nontechnical programs, a chicken barbecue (new this year), and awards. Talk-in on 146.31/.91 (W2EUP/R) and 146.52. For more information, write Nelson Oldfield, 128 Greenway Boulevard, Cheektowaga NY 14225.

LARAMIE WY
SEP 7-9

The Northern Colorado ARC, the University of Wyoming ARC, and the Shy-Wy ARC will jointly sponsor the fifth annual High Plains Ham Roundup on September 7-9, 1984, at the Yellow Pine Campground in the Medicine Bow National Forest (35 miles west of Cheyenne). There are no registration fees except for a modest Forest Service charge for campers. Saturday's schedule will include a campfire cookout and bring-your-own covered-dish extravaganza (barbecued hamburgers and liquid refreshments provided), with sing-along music and entertainment by regional talent. Also on Saturday will be a giant tailgate swapfest, a transmitter hunt, and technical displays. Talk-in on .22/.82 and .25/.85. For further information, write Jack Hayes W7CGK, 1321 E. 22 Street, Cheyenne WY 82001.

UNIONTOWN PA
SEP 8

The Uniontown Amateur Radio Club will hold its 35th annual Gabfest on the Saturday after Labor Day, September 8, 1984, on the club grounds located on the Old Pittsburgh Road, just off Route 51 and the 119 bypass, Uniontown PA. Registration is $3.00 each or 2 for $5.00. There will be free parking, free coffee, and a free swap and shop with registration. Refreshments will be available. Talk-in on 147.645/.045 and 144.57/1.17. For further information, contact UARC Gabfest Committee, c/o John T. Cermak WB3DOD, PO Box 433, Republic PA 15475, or phone (412)-246-2870.

WINDSOR ME
SEP 8

The Augusta Emergency Amateur Radio Unit will sponsor the 1984 ARRL-sanctioned Windsor Hamfest on Saturday, September 8, 1984, at the Windsor Fairgrounds, Windsor ME. The gate donation is still $1.00 and camping will be available on Friday and Saturday nights. Features will include a flea market, programs, speakers, commercial distributors, light meals, and the tradi-

tional Saturday bean and casserole supper. Talk-in on the 146.22/.82 repeater. For further information, contact Don Hanson N1AZH, RFD #2, Box 3678, Greene ME 04236, or phone (207)-946-7557.

MARION IN
SEP 8

The 5th annual Grant County (Indiana) Amateur Radio Club hamfest will be held on Saturday, September 8, 1984, beginning at 8:00 am, at McCarthy Hall, St. Paul's Catholic Church, Marion IN. Donations are $2.00 in advance and $3.00 at the gate. Reservations for an 8-foot table are $2.00 each. Refreshments and free parking will be available. Talk-in on 146.19/.79 and 146.52 simplex. For more information and tickets, send an SASE to Jim Allman WD9EOI, 1108 Spencer Avenue, Marion IN.

MELBOURNE FL
SEP 8-9

The Platinum Coast Amateur Radio Society will hold its 19th annual hamfest and indoor swap-and-shop flea market on September 8-9, 1984, at the Melbourne Auditorium. Admission is $3.00 in advance and $4.00 at the door. Swap tables are $10.00. There will be food and plenty of free parking available, as well as awards, forums, and meetings. Talk-in on .25/.85 and .52/.52. For reservations, tables, and more information, write PCARS, PO Box 1004, Melbourne FL 32901.

SAN ANGELO TX
SEP 8-9

The San Angelo Amateur Radio Club will hold CEN TEX HAMFEST '84 on September 8-9, 1984, in the San Angelo Convention Center. Tickets are $5.00 in advance and $6.00 at the door. Hours for Saturday are noon to 6:00 pm and for Sunday, 8:00 am to 2:00 pm. Special events for the ladies include a Saturday afternoon tour of Fort Concho and Old San Angelo. There will be seminars and group meetings Saturday afternoon and Sunday morning, and a reception for dealers followed by a social hour for amateurs on Saturday night. Talk-in on 146.34/.94. For pre-registration or hotel/motel accommodations, write CEN TEX HAMFEST '84, PO Box 3751, San Angelo TX 76902.

BUTLER PA
SEP 9

The Butler County ARA, Inc., will sponsor their 7th Butler Hamfest on Sunday, September 9, 1984, from 9:00 am to 4:00 pm, at the Butler Farm Show Grounds at Roe Airport, Butler PA. The admission donation is $1.00 and children under 12 will be admitted free. The outside flea market is free and the indoor flea-market vendor's space is $5.00 per 8-foot table. Overnight campers will be welcome and there will be plenty of parking. Other overnight accommodations are available at area motels and fly-in accommodations are available at the airport. Talk-in on .96/.36, .84/.24, and .52. For more information, contact Dan Metrick WA3GDS, 131 Reiger Road, Butler PA 16001, or phone (412)-283-1719.

TORRINGTON CT
SEP 9

The CO Radio Club will hold its hamfest on Sunday, September 9, 1984, from 8:00 am to 4:00 pm, at the Torrington Retirees Drop-in Center, East Albert Street. Admission is $2.00, tables are $7.00, and the fee for tailgating is $5.00. Talk-in on 146.05 and 147.24. For more information, write Donald D. Taylor KA1GKJ, PO Box 455, Watertown CT 06795.

MONETT MO
SEP 9

The Ozarks Amateur Radio Society will hold the 3rd annual Ozarks Amateur Radio Club Congress and Swapfest on Sunday, September 9, 1984, beginning at 11:00 am, at the Monett City Park, junction of highways US 60 and MO 37, Monett MO (between Springfield and Joplin). There is no admission charge and no charge for swap space (available on a first-come, first-serve basis). The buffet dinner begins at 1:00 pm (bring a single covered dish and share in the feast). Talk-in on the 146.37/.97 repeater and 7.250 MHz. For more information, contact the Ozarks Amateur Radio Society, Box 327, Aurora MO 65605.

CARTERVILLE IL
SEP 9

The Shawnee Amateur Radio Association will hold its 28th annual hamfest on September 9, 1984, at the John A. Logan Junior College Campus, Route 13 west, Carterville IL (6 miles east of Carbondale). Admission is $3.00 and flea-market tables are free. Activities will include forums, ladies events, and lunch served on the campus. There will be camping available across the road, motels nearby, and plenty of free parking. Talk-in on 3.925 from 8:00 am to 9:00 am and on 146.25/.85. For more information, phone Bill Johnson W9ERI at (618)-457-7586.

GRAND RAPIDS MI
SEP 15

The Grand Rapids Amateur Radio Association, Inc., will hold its annual Swap and Shop on Saturday, September 15, 1984, beginning at 8:00 am, at the Hudsonville Fairgrounds. There will be dealers, a concession, an indoor sales area, and an outdoor trunk-swap area. Talk-in on 146.16/.76. For more information, write Grand Rapids Amateur Radio Association, Inc., PO Box 1248, Grand Rapids MI 49501.

SEBASTOPOL CA
SEP 15

The Sonoma County Radio Amateurs, Inc., will hold their second annual ham-radio flea market on Saturday, September 15, 1984, from 8:00 am to 2:00 pm, at the Sebastopol Community Center, 390 Morris Street, Sebastopol CA (5 miles west of Santa Rosa, just off Hwy. 12). Admission and parking are free. Tables are $5.00 in advance and $6.00 at the door. Vendor set-up starts at 7:00 am. Features will include a radio clinic, exhibits, refreshments, and an auction around noon. Talk-in on 146.13/.73. For tickets and more information, write SCRA, Box 116, Santa Rosa CA 95404.

MOBILE AL
SEP 15-16

The Mobile Amateur Radio Club will sponsor the Hospitality Hamfest on September 15-16, 1984, beginning at 9:00 am, at the Texas Street Recreation Center off I-10. Admission is free. There will be XYL/YL activities, swap tables, adequate parking, reasonable overnight rates, and good food. Talk-in on 146.22/.82. For more information, contact Porter Chambers KI4FE, 3320 Emelye Drive, Mobile AL 36609, or phone (205)-661-1160.

PEORIA IL
SEP 15-16

The Peoria Area Amateur Radio Club will hold its Peoria Superfest '84 on September 15-16, 1984, at the Exposition Gardens, W. Northmoor Road, Peoria IL. The gate opens at 6:00 am and the Commercial Building at 9:00 am. Admission is $3.00 in advance and $4.00 at the gate; children under 12 will be admitted free. Activities will include amateur-radio and computer displays, a huge flea market, a free bus to Northwoods Mall on Sunday, and a Saturday-night informal get-together at Heritage House Smorgasbord, 8209 N. Mt. Hawley Road, Peoria IL. There are full camping facilities on the grounds. Talk-in on 146.16/.76 (W9UVI). For reservations and more information, send an SASE to Superfest '84, PO Box 3461, Peoria IL 61614.

SUTTON NH
SEP 16

The Connecticut Valley FM Association will hold its 8th annual hamfest and flea market on September 16, 1984, from 9:00 am to 5:00 pm, rain or shine, at King Ridge Ski Area, Sutton NH (exit 11 off I-89). General admission is $2.00 and for dealers or flea marketeers, the fee for tailgating or tables is $3.00 each. Food will be available on the premises and there will be overnight camping only for self-contained units. Talk-in on 146.16/.76 or 146.52 simplex.

MT. CLEMENS MI
SEP 16

The L'Anse Creuse Amateur Radio Club will hold their 12th annual swap and shop on Sunday, September 16, 1984, from 9:00 am to 3:00 pm, at the L'Anse Creuse High School, Mt. Clemens MI. Take I-94 east-bound to the Metropolitan Parkway exit;

then take the Metropolitan Parkway to Crocker; turn left on Crocker to Reimold and then right on Reimold to the last school, L'Anse Creuse High School. Admission is $1.00 in advance and $2.00 at the door. FCC representatives will be there, as well as plenty of new and used gear. There will be lots of food and parking. Talk-in on 147.69/.09 and 148.52. For more information, send an SASE to Maurice Schietecatte N8CEU, 15835 Touraine Court, Mt. Clemens MI 48044, or phone (313)-286-1843.

NEW KENSINGTON PA
SEP 16

The Skyview Radio Society will hold its annual hamfest on Sunday, September 16, 1984, from noon until 4:00 pm, at the club grounds on Turkey Ridge Road, New Kensington PA. Registration fee is $2.00 and vendors' fees are $4.00. Awards will be presented. Talk-in on .04/.64 and .52 simplex.

AUGUSTA GA
SEP 16

The Amateur Radio Club of Augusta will hold its annual hamfest on September 16, 1984, at Julian Smith Casino Park. Tickets are $1.00 each, 6 for $5.00, or 13 for $10.00. Features will include a flea market in the parking lot, a barbecue, refreshments, dealers, entertainment, and on Saturday evening, a hospitality room at Ramada Inn West, Washington Road, rooms 108-110. Talk-in on 145.49 – 600. For more information, send an SASE to D. F. Miller WB4YHT, Hamfest Chairman, 4505 Shawnee Road, Martinez GA 30907, or call 1-(404)-860-3700.

VENICE OH
SEP 16

The forty-seventh annual Cincinnati Hamfest will be held on Sunday, September 16, 1984, at Stricker's Grove, State Route 128, one mile west of Venice (Ross) OH. Admission and registration are $5.00. Features will include a flea market (radio-related products only), exhibits, music, talks, a hidden transmitter hunt, and an air show. Food and refreshments will be available. For more information, contact Lillian Abbott K8CKI, 317 Greenwell Road, Cincinnati OH 45238.

GRAYSLAKE IL
SEP 22-23

The Chicago FM Club will sponsor Radio Expo '84 on Saturday and Sunday, September 22-23, 1984, at the Lake County Fairgrounds, Rtes. 120 and 45, Grayslake IL. Tickets, good for both days, are $3.00 in advance and $4.00 at the gate. The flea market will open at 6:00 am and the exhibits will open at 9:00 am. There will be a giant outdoor flea-market area. Reserved indoor flea-market tables are available for $5.00 per day. Other features will include seminars, technical talks, ladies' programs, and free parking and overnight camping. Talk-in on 146.16/.76. For more information, send an SASE to Radio Expo '84, Box 1532, Evanston IL 60204, or phone (312)-582-6923.

VIRGINIA BEACH VA
SEP 22-23

The 1984 ARRL Roanoke Division Convention and 9th annual Amateur Radio/Computer Fair will be held on Saturday and Sunday, September 22-23, 1984, from 9:00 am to 5:00 pm both days, at the Virginia Beach VA Pavilion. Admission for both days is $4.00 in advance and $5.00 at the door. Flea-market tables are $5.00 for one day and $8.00 for both days. Features include dealers, special displays, forums, computer equipment, a giant flea market, free XYL bingo, and movies for the kids. For tickets and more information, write Jim Harrison N4NV, 1234 Little Bay Avenue, Norfolk VA 23503, or call (804)-587-1695.

WICHITA FALLS TX
SEP 22-23

The annual Wichita Amateur Radio Society Tornado Alley Hamfest will be held on Saturday and Sunday, September 22-23, 1984, at the National Guard Armory, Wichita Falls TX. The hours on Saturday will be 9:00 am to 5:00 pm and on Sunday, 9:00 am to 2:00 pm. Registration will begin at 9:00 am both days and is $4.00 per person in advance and $5.00 at the door. Pre-registration closes Wednesday, September 19th. There will be a large indoor flea market and tables are $3.00 each. Features will include commercial dealers' displays, computer dealers and demonstrations, ladies' activities, and special events. If you wish to take an amateur exam, send FCC form 610 to the hamfest address prior to August 17, 1984. A concession stand will be open both days. Talk-in on 146.34/.94, 147.75/.15, 449.30/444.30, and 449.20/444.20. For more information or pre-registration, contact WARS Hamfest, PO Box 4363, Wichita Falls TX 76308.

DANBURY CT
SEP 23

The Candlewood Amateur Radio Association will hold its annual flea market on Sunday, September 23, 1984, from 10:00 am to 4:00 pm, at the Elks Lodge, 346 Main Street, Danbury CT (exit 5 off I-84). Admission is $2.00 and tables are $7.00. Refreshments will be available. Talk-in on 147.72/.12. For advance table reservations, contact CARA, PO Box 2038, Danbury CT 06810. For more information, phone George Politzi KC2QF at (914)-533-2758, Rose Parrack WA1VOP at (203)-743-6834, or George Slater AF1U at (213)-438-0549.

GAINESVILLE GA
SEP 23

The 11th annual Lanierland ARC Hamfest will be held on September 23, 1984, beginning at 9:00 am, in the Holiday Hall at Holiday Inn, Gainesville GA. There will be free tables and an inside display area for dealers reserving in advance. A large parking lot will be available for the free flea market. Other features will include a left-foot CW contest, a ladies' country store, and many activities. Talk-in on 146.07/.67. For more information and reservations, contact Phil Loveless KC4UC, 3594 Thompson Bend, Gainesville GA 30506, or call (404)-532-9160.

WICHITA KS
SEP 23

The Wichita Hamfest will be held on September 23, 1984, at Camp Hiawatha, 1701 West 51st Street North, Wichita KS 67204. Features will include a flea market, programs, and commercial exhibits. For more information, contact Norm Tramba WAØHWH, 340 S. 1st, Clearwater KS 67026, or phone (316)-584-6425.

WILLIMANTIC CT
SEP 23

The Natchaug Amateur Radio Association will hold its annual giant flea market on Sunday, September 23, 1984, from 9:00 am to 4:00 pm, at the Elks Home, 198 Pleasant Street (off Route 32), Willimantic CT. Admission is $2.00 and children under 16 will be admitted free. Tables are $5.00 in advance and $7.00 at the door (dealers will be admitted at 8:00 am). Food, drinks, and free parking will be available. Talk-in on the 147.30/147.90 repeater and .52 direct. For more information, contact Ed Sadeski KA1HR, 49 Circle Drive, Willimantic CT 06226, or phone (203)-456-7029.

ADRIAN MI
SEP 23

The Adrian Amateur Radio Club will hold its 12th annual hamfest on Sunday, September 23, 1984, at the Lenawee County Fairgrounds, Adrian MI. Because tables are limited, reservations (by check or cash) must be made no later than September 15, 1984. For more information, tickets, or tables, contact Adrian Amateur Radio Club, PO Box 26, Adrian MI 49221.

ELMIRA NY
SEP 29

The Elmira Amateur Radio Association will present the ninth annual Elmira International Hamfest on September 29, 1984, from 6:00 am to 5:00 pm, at the Chemung County Fairgrounds. Activities will include an outdoor flea market, indoor dealer displays of new equipment, and breakfast and lunch served on the premises. Tickets are available at the gate or in advance from Steve Zolkosky, 118 East 8th Street, Elmira Heights NY 14903.

HAMILTON ONT CAN
OCT 6

The Hamilton Amateur Radio Club, Inc., will hold its 2nd annual flea market on Saturday, October 6, 1984, beginning at 8:30 am, at Marritt Hall, Ancaster Fairgrounds, 625 Highway 53 East. Admission is $2.00. Flea-market vendors' 6-foot tables are $4.00 plus admission and commercial vendors' 8-foot tables are $10.00 with admission included. There will be room for 150 vendors and setup will be from 7:00 am to 6:30 am. Coffee, soft drinks, and sandwiches will be available. Talk-in on 146.16/146.76 (VE3NCF). For space reservations, contact HARC Flea-Market Committee, PO Box 253, Hamilton ONT L8N 3C8. For more information, contact Stan VE3GFE on VE3NCF.

WARRINGTON PA
OCT 6-7

The Pack Rats (Mt. Airy VHF ARC) cordially invite all amateurs and their friends to the 8th annual Mid-Atlantic VHF Conference which will be held on Saturday, October 6, 1984, from 9:00 am to 5:00 pm, at the Warrington Motor Lodge, Route 611, Warrington PA, and to their 13th Pack Rat Hamarama on Sunday, October 7, 1984, from 7:00 am to 4:00 pm, rain or shine, at the Bucks County Drive-In Theater, Route 611, Warrington PA. The conference will feature an all-day VHF program, a cocktail hour and get-together at 6:30 pm, and a buffet dinner ($13.00 each) at 7:30 pm. Conference registration is $4.00 in advance (before September 23rd), $5.00 at the door, and includes admission to the Hamarama. Admission to the Hamarama flea market on Sunday is $3.00 and selling spaces are $5.00 each. The gate will open at 6:00 am for sellers (bring your own tables). Food and drink will be available. Talk-in on 146.52 MHz (W3CCX). For more information, contact Hamarama '84, Post Office Box 311, Southampton PA 18966, or phone Lee A. Cohen K3MXM at (215)-635-4942.

BALTIMORE MD
OCT 7

The Columbia Amateur Radio Association will hold its 8th annual hamfest on Sunday, October 7, 1984, from 8:00 am to 3:30 pm, at the Howard County Fairgrounds (15 miles west of Baltimore, just off I-70 on Route 144, 1 mile west of Route 32). Admission is $3.00 and XYLs and children will be admitted free. Tables are $6.00 additional if paid by September 30th and $8.00 additional after that date. Outdoor tailgating is $3.00 additional and indoor tailgating is $6.00 additional. Food will be available. Talk-in on 147.735/.135 and 146.52/.52. For table reservations and more information, write Mike Vore W3CCV, 9098 Lambskin Lane, Columbia MD 21045, or phone (301)-992-4953.

SYRACUSE NY
OCT 13

The Radio Amateurs of Greater Syracuse 1984 Hamfest will he held on Saturday, October 13, 1984, beginning at 9:00 am, at the Art and Home Center Building, New York State Fairgrounds, Syracuse NY (adjacent to Interstate 690, just 3 miles southeast of the NYS Thruway, exit 39, and one mile northwest of Syracuse and Route 81). The hamfest will have complete indoor facilities and, weather permitting, there will be an outdoor flea market in the front courtyard. Volunteer exams will be given for Novice, Technician, and General classes. Breakfast and lunch service will be available. Commercial exhibitors may begin their setup on Friday from 7:30 pm to 10:00 pm and on Saturday from 7:00 am to 9:00 am

DOVER MA
OCT 20

The Middlesex Amateur Radio Club will hold its annual Amateur Flea Market on October 20, 1984, from 9:00 am to 3:00 pm, at Dover Town Hall, Dover MA. Admission is $1.00 and tables are $8.00 each. Refreshments and ample free parking will be available. For further information, send an SASE to Irv Geller KO1N, 1450 Worcester Road, #422A, Framingham MA 01701.

LETTERS

MASS. CLASSES

We're sponsoring Novice and Technician/General classes to be held at Chelsea High School (Chelsea MA) starting September 18, 1984. Classes will be held on Tuesday and Thursday nights from 7:30 to 9:00 pm. The classes are free, but the cost of materials will be paid by the students. For information, contact me at the address below (please include your phone number).

Frank Masucci K1BPN
c/o 1979 Amateur Radio Association
PO Box 171
Chelsea MA 02150

REVIEW

PROPAGATION BY MUFPLOT

If you own an Apple or Commodore computer, MUFPLOT, from Base (2) Systems, 2534 Nebraska Street, Saginaw, Michigan 46601, will make propagation predictions a cinch! Both the Commodore 64 and the Apple II versions were reviewed. They operate in virtually an identical fashion. A VIC-20 version is also available.

Scientists have been making radio-frequency-propagation predictions for years. It used to be a very tedious process that took hours to determine the best frequency between two points. Good math skills and the ability to put a slide rule through its paces were required. With the home computer, it's now possible to let your fingers do the walking!

Since the public became aware of the "Mini-Muf" program created by Bob Rose and his fellow scientists, the market has been flooded with MUF (Maximum Usable Frequency) programs. Some of them are overpriced. Some of them are just poorly conceived. MUFPLOT on the other hand is an excellent example of a good dollar value, delivering a lot of features for the price.

The instructions for MUFPLOT take about 18 small pages. The program is written well enough that many computerists are able to operate it without ever seeing the book!

MUFPLOT will calculate for you the maximum usable frequency, the highest possible frequency (HPF—good for six-meter DXers), or the frequency of optimum traffic (FOT). Additionally, the lowest usable frequency (LUF) is calculated.

Many of the MUF programs on the market do these things. What sets MUFPLOT above many of them are several additions that make the necessary inputs as simple as possible.

When first using the program, it will be necessary to enter your exact latitude and longitude. This information is stored to disk so that MUFPLOT will have the information for all future sessions. The information can be changed easily, should you move or wish to calculate predictions for an area other than you own.

You must enter the end point of the transmission path you wish MUFPLOT to calculate. The beauty of this input is that you can select one of several different methods to specify the location. You may enter the DX prefix, the US postal abbreviation, or a specific latitude and longitude.

You can output the plot adjusted to whatever time zone you wish to use.

Like all MUF programs, you must enter the solar-flux data received from WWV. It's then time to get on with the computations!

Unless you tell it otherwise, MUFPLOT will show the MUF as the upper line on the graph. You may select FOT or HPF and the graph will be changed accordingly.

After just a few seconds, MUFPLOT will begin plotting the graph on the screen. Both the C-64 and Apple II graphics presentations were quite nice. The Apple II version, displayed on an amber monitor screen, was particularly sharp.

If you would like a printed copy of the graph, simply select the print option. You may output as many copies as you like. Standard ASCII characters are used, so the high-resolution graphics presentation is diminished somewhat. This was considered only a very minor trade-off.

As a bonus, MUFPLOT also gives you the correct distance and beam heading from your location to the DX location.

MUFPLOT is supplied on disk. The C-64 version uses compiled Basic (Petspeed) as does the Apple II version. This means faster operation for you. The programs can be backed up, though the C-64 version comes with a "MUFKEY" which must be inserted in the joystick port for proper operation. Failure to do so results in a very interesting "STOLEN" message running across your screen!

If you've been looking for a very versatile MUF program, MUFPLOT may be your answer. It is highly recommended.

For further information, contact *Base (2) Systems, 2534 Nebraska Street, Saginaw MI 48601.* Reader Service number 484.

Jim Grubbs K9EI
Tim McDonough WD9EDT
Springfield IL

A LOOK AT THE ICOM 271A

Two meters. Those two words inspire varied thoughts for different people. To some people, two meters means exciting sporadic-E DX communications, to others, transcontinental Mode-A satellite communications or local SSB chats. Of the many uses for the two-meter band, the most popular is FM-repeater operation. No matter what two meters brings to your mind, one fact is clearly evident: The technology involved in two-meter communications equipment has rapidly advanced during the past few years.

A quick glance to compare an amateur-radio magazine printed a few years ago with a more recent issue is evidence of the incredible advancements that have been made in amateur communications equipment. All areas of amateur communications have changed, from the usual low-band units to the recent computerized RTTY stations. Not overlooked by the jump in technology during the last few years is the ever-popular two-meter radio.

Today, the fully-synthesized two-meter radio with its multitude of memories and other functions is the standard. However, it was not too many years ago that crystallized rigs were the norm. Hand-helds were bulky and offered only five or six channels. Scanning was a rare luxury and rigs that covered the entire two-meter spectrum were often of poor quality. It is difficult to imagine the days when these radios were common, especially for newcomers who glance through the ads in magazines and see the advanced equipment of today.

Rigs with new and innovative features have been coming out repeatedly. Two built-in vfo's, memories, all-mode squelch, digital displays, and even voice synthesizers are examples of the many advancements that have been made in commercial equipment over the past few years. Today's HF rigs include most of these features as standard equipment; however, until recently, a two-meter rig with most of these advanced features incorporated together has been a dream.

Icom's latest introduction to the two-meter world, the Icom 271A, fits the bill of the ideal two-meter rig very nicely. This rig combines most of the features any two-meter operator could ever want. The ideal rig? Perhaps. Read on and see!

Specifications

The unit has many features which make it a joy to operate. The vast majority of operating capabilities are under the direct control of a microprocessor. Two separate vfo's can be used independently or together for either simplex operation or split operation with any desired split. There are 32 memories available; each can store the operating frequency, mode, offset (if any), and a PL™ tone which is generated by an internal PL tone encoder. The encoder is a very handy feature for use with closed repeaters, remote-control applications, etc., and the fact that it's built-in means one less piece of equipment sitting on your shelf!

The front panel of the unit is designed with the user in mind. A good-sized tuning knob and continuous wraparound tuning (which allows tuning off the top end of the band and continuing from the bottom of the band) allow for easy tuning. One of the more enjoyable features of the radio is its two-color luminescent display. It displays all the information needed for logging purposes (operating frequency, offset direction and amount, the vfo in use, the operating mode, receiver incremental tuning degree, memory channel, and PL tone). Of course, not all the information can be displayed at one time! All this is displayed in two colors: red and blue. The unit operates on the standard twelve volts supplied by most power supplies, or an external ac power supply can be purchased as an option. These features, and many more, when utilized to their fullest extent can handle almost any conceivable operating situation.

The IC-271A two-meter transceiver from Icom.

Before we continue with the many features and capabilities of the radio, let's take a look at its design. The radio's physical appearance is very attractive; its sleek gray finish fits in with most other modern radios. Despite its many innovations, the unit has been carefully designed to match other Icom radios as well as most other modern radios in the same class.

Design and Features

The case itself measures 110 mm(H) × 285 mm(W) × 275 mm(D), and the unit weighs 5.2 kg. The Antenna connector, which is the standard 50-Ohm, unbalanced PL-259, is located on the back panel. Also located on the back panel are the Keyer jack, the Ground connection, the External-Speaker jack, the Power-Supply plug, and a removable plate for use with the optional internal power supply. On the left side of the radio are four rubber feet so that it may be stood up on its side. Located on the right side is a handle for easy portability. The bottom has the usual rubber feet and a fold-down stand that lifts the front of the unit an inch or so above the operating surface. The top panel is barren except for vent slits and an enclosure which houses the VOX controls. Now all sides are accounted for except for the one most often seen; the front panel.

At first, the dazzling array of buttons and knobs may be awe inspiring, but as you will soon see, they are arranged by function and are easy to use. In fact, many of the switches are rarely touched after the initial programming of the radio. However, they are there for use whenever an unusual operating condition presents itself.

The first thing that most people notice when they first see the radio is its digital display. The dual colors make for an easy inspection of the current setting of the radio without looking all over at many different switches. Since you have already been introduced to the display, we will leave it for a while then return to it, for it is the central area where current information is displayed.

To the left of the display is the meter. This meter provides a lot of information. It can serve as a signal-strength indicator, a relative-power output meter, and an FM reactance meter. Of course, the mode the radio is in determines what is displayed on the meter. It is back-lighted and is very easy to read in dim light or darkness, and the comparatively large print used on the meter helps.

Between the display and the meter are three LEDs which indicate Transmit mode, Receive mode, and PL tone on. They are easy to see, and each is a different color so they are easily identified in poor lighting conditions where reading the labels would be difficult.

To the left of the meter are six buttons which are used mostly in the programming of the unit's memories. The OW (offset write) button is used to change the frequency of the offset to any desired split, and the + Duplex and − Duplex buttons are used to indicate the direction of the offset. Both the offset and its direction can be stored along with other information in the unit's 32 memories.

Located in the same group of six buttons are the PL tone select switches, which again are used mostly during the programming of the memories. The Tone button turns on the internal encoder so that the indicated tone will be transmitted. The Select button is used to choose one of the 32 available tones, which can be stored along with the other information in the memories.

Finally, the last of these six buttons is he Check switch. It is similar to the Reverse button on many other two-meter radios in that it allows you to change the receive frequency by increasing or decreasing it by the offset stored with the frequency. Using this feature, you could check the input of a repeater to see if you could hear the other party without the aid of the repeater, and thus determine if simplex operation is possible. The check feature is activated only as long as the button is depressed.

The lower left corner of the front panel contains the greatest number of buttons and knobs. The Power switch, a push-in locking switch, is located in the middle of the row of switches at the far left. Directly below the Power switch is the Transmit/Receive switch. It is the usual lever switch and is used mostly on CW. The microphone connector is the next in line and is an 8-pin connector with the capability for remote up/down frequency control. The Mode buttons are located to the right of the Power and T/R switches.

The modes available are (from top to bottom): FM, USB, LSB, and CW. These are not locking switches, and when they are pressed, the mode indicator in the display switches to the correct mode, and when released, the switch returns to its original position. Next to the Mode buttons are several function buttons. These switches lock and must be pressed again to return them to their normal state. They are (from left to right): VOX, NB (noise blanker), AGC (automatic gain control), Meter, Preamp, and Mode Scan.

The VOX is simple enough; press it in when you want the transmitter to trip whenever there is a signal loud enough to trip the threshold control which is located under a panel on the top of the radio. However, the VOX only works in the SSB and the CW modes, not in the FM position.

The noise blanker is easy to use also. Whenever there is any interference coming into the radio, push the button in. It will attenuate electrical pulse noise from the power line and the air; however, it is fixed and not variable.

The Meter switch is used for switching between the two functions of the meter when in the Receive mode. It is a relative-power indicator when in the Transmit mode. However, it can serve as either an S-meter or an FM reactance meter depending on which position the switch is in.

The Preamp switch kicks in the optional preamp when it is needed. However, without the preamp installed, the switch does nothing no matter which position it is in. In short, the switch is useless until the optional preamp is installed.

The last of the function switches is the Mode Scan. It is used when you want to scan memories that contain only a selected mode. For example, it could be set to FM and scan only only those memories which contained FM as their mode. Such a feature could be used for selectively scanning the local repeaters or for the satellite beacons, etc.

Three knobs and the Phones jack are located below the function switches. The Phones jack is the standard 0.25-inch phono-plug jack. The knobs each contain concentric dials and thus each serve a dual purpose.

The first concentric knob moving from left to right is the AF/RF Gain. It, of course, is used to set the volume of the audio and the level of the rf gain. Next in line is the Squelch/Tone knob. By turning these, you can set the all-mode squelch so that no sound will be heard unless there is a signal present on the frequency. Also, the tone of the audio can be adjusted. The last knob on this row is the Mic Gain/RF Power. The Mic Gain is used to set the drive from the microphone necessary to modulate the output signal, and the RF Power is used in conjunction with the relative-power output meter to adjust the power output up to 25 Watts.

Located beneath the digital display and to the right of the function switches are the main tuning knob and a few other buttons. The tuning knob is very civilized and responds well. It's weighted perfectly and rotates effortlessly. To the lower left of the tuning knob is a small square switch. It is used to lock the display in order to prevent accidental frequency change from bumping the tuning knob or inadvertently pressing a button. It is also used in conjunction with the optional internal speech synthesizer when it is installed.

To the right of the tuning knob are three switches (from top to bottom): TS (tuning step), DFS (dial function select), and Split. The first, tuning step, is used to change the tuning increment to 1 kHz in any mode. The 100-Hz digit on the display is cleared to show 0. The tuning returns to normal increments when the switch is released. This function allows quick QSYing over a great frequency range in SSB and CW and tuning to FM signals which are not located on the standard 5-kHz step.

The next switch in line, the dial function select, serves two purposes, depending on whether you are in memory mode or using the vfo. If you are tuning with the vfo, the switch allows you to lock the vfo and use the tuning knob to rotate through the 32 memories. If you are recalling memories, activating the switch will cause the memory-channel select to lock; the tuning knob now serves to adjust the frequency.

The last switch is the Split switch. It is used to allow the unit to operate at any conceivable split. By activating the switch, one vfo is used for the transmit frequency and the other is used for the receive frequency. Whichever vfo was in use when the switch was pressed will become the receive frequency.

To the right of the tuning-knob area are another knob and a few more switches. The knob is the RIT. The RIT is used to adjust the receive frequency by up to 9.9 kHz in either direction. This is very useful for sensitive fine tuning where you do not want to disturb the transmit frequency knob. The knob is activated by pressing the RIT button, and the RIT is cleared by pressing the Clear button.

Below the RIT controls are MHz Up and Down switches. Because the two-meter band is so large, tuning up and down the band with the tuning knob would take quite a while, not to mention how tiring it would be! To prevent this problem, the MHz Up and Down switches were added. You can jump up or down in 1-MHz steps with a press of the appropriate switch.

The last group of switches in the front panel is located to the right of the display and above the RIT controls. These six switches control the operation of the vfo and the memories. The A/B switch is used to switch between vfo's A and B. The A = B switch is used to set the two vfo's to the same frequencies. The VFO/M switch is used to switch between the vfo mode and the memory mode. In the vfo mode, the tuning knob is used to change the frequency of the vfo. However, in the memory mode, the tuning knob is used to select one of the 32 memories. The Write switch is used to write all the information indicated on the display into the memory. The M-VFO switch is used to put the contents of a memory into a vfo, and the Scan switch is used to either scan through the memories, or to scan through a selected range of frequencies within the limits determined by the contents of the first two memories.

Now that you are well aware of the many features of this radio and how they work, we can look at how they are applied in typical operating situations. The number of buttons and switches may seem imposing at first, but they are easy to learn and even easier to use. All these features may seem a bit much, but as you will see, they can be utilized effectively to increase your operating pleasure in all but the most simple situations.

When I first received the radio, it took me about 10 minutes to set it up and attach it to my TS-130 power supply. After playing with it for a few minutes I decided it was time to break out the manual and put it through its paces. After tuning around and punching the buttons, I learned that not using the memories takes away a lot of the radio's capabilities, so I tried to program one.

Memories

The manual gives clear examples of how to program the memories and after the first one was programmed, the manual was no longer needed. Reserving the first two memories for the upper and lower frequencies for the band-scan feature, I decided to put a local repeater into the third memory. First I set the mode to FM and tuned the vfo to 145.23 MHz, which is the output frequency of the repeater. Then I set the offset to 600 Hz by pressing the offset write button and turning the tuning knob until 600 was displayed. Next I pressed the −Duplex button to register the offset as negative, and I was done. However, if the repeater had required a PL tone for access, I could have entered it also by pressing the Tone Select button and turning the tuning knob until the desired tone was displayed.

In order to store the specifications I had just set into memory three, I put the radio in the memory mode by pressing the VFO/M button and turning the tuning knob until memory 03 was displayed on the right side of the display. Next, I double-checked the display to make sure the information was entered correctly. Yes, the display indicated the correct frequency, offset, mode, and memory, so I pressed the Write button and the information was entered in memory 3. The same procedure was repeated for the other repeaters I wanted to enter into memory, changing only the frequency, offset direction, etc., depending on how different this repeater was from the one I'd just entered. By canceling out the offset, simplex frequencies can be entered along with their modes, i.e., 146.52 FM, 144.30 CW, 144.85 SSB, etc.

Now that there were several frequencies stored in the memories, I was able to recall them by putting the radio in memory mode and turning the tuning knob. As each memory was displayed, the information was automatically entered to the display and the radio was ready to operate as set in that memory. By pressing the Scan button in the memory mode, the radio scans through the 32 memories and stops whenever a signal interrupts the squelch. After a few seconds, it continues scanning. Pressing the Scan button again will stop the scanning.

To put the contents of a memory into a vfo, I recalled the memory in the memory mode, then pressed the VFO/M button again to enter the vfo mode. By pressing the M-VFO button, the memory contents were entered into the indicated vfo. Now I was able to take advantage of the vfo while retaining the desired memory specifications.

Operating the Radio

As you can well imagine, all of these features along with the memories can make operating two meters a lot of fun. The versatility of the rig and its ability to adapt to different operating habits ideally suits this radio to any two-meter user. I have used the rig under many different operating conditions and have always been pleased with its performance.

I was able to put the radio through a test during the VHF sweepstakes and it performed beautifully. I ran it at a full 25 Watts into a 10-element yagi mounted in the attic and had some surprising results. My most distant contact was Connecticut from my home near Philadelphia, Pennsylvania. This was very good considering the number of people that were calling him also. I found the noise blanker to be a useful feature and my audio reports on SSB and FM were excellent. I tried to utilize every feature during the contest and found them all to be a great help.

The radio's precise tuning and the RIT feature make it excellent for satellite use. Although I received the radio too late for use in the recent space shuttle mission, I am sure its features would have been a great help. The quick access to the memories would have been a great boost in monitoring all the transmit and receive frequencies.

The radio performs just as well under more conventional operating conditions such as rag-chewing, repeaters, and nets. Because the memories may be set up in any manner, the radio may be customized to any user's typical operating conditions. The more exotic features such as the unlimited splits are there when you need them and are not hard to use. My radio has been operated on all modes from CW to RTTY (AFSK) and is testament to the great versatility of the rig. This is the super rig that every two-meter buff has dreamed of. And, if the built-in features are not enough, there is a wide array of options available.

Options

Among the options available, the internal power supply and speech synthesizer have already been mentioned. Other options include a PL tone decoder and a computer interface. Of course, the usual array of microphones and other accessories is available. The radio comes equipped with an up/down mike, but it lacks touchtones™, so the touchtone mike is one of the first accessories you should look at. Also, a more powerful version of the 271A is available, the IC-271H, which has an output power of up to 100 Watts. A version is also available for the 440-MHz band, the IC-471.

Conclusion

Overall, I was very pleased with the

WHAT DO *YOU* THINK?

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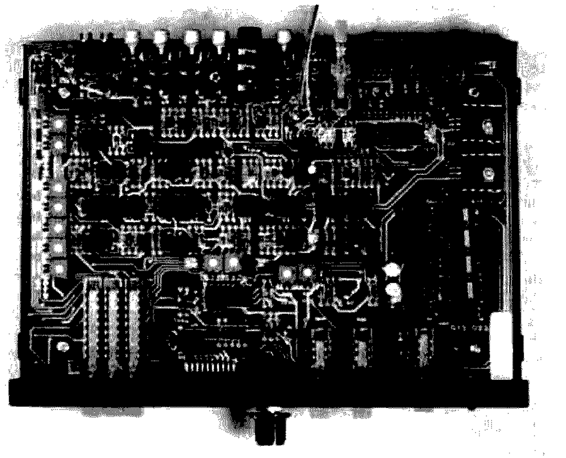
AEA's CP-1 Computer Patch.



Interior view.

radio, both in its design and operating abilities. It is definitely a first-class rig which is sure to be a big success. I got the last one the store had in stock! If Icom is listening, a VOX for FM would be nice. It is available for hand-helds and should be included in this excellent rig. I have just about run out of words of praise for this stupendous transceiver. Let it suffice to say that this rig would top my list of necessary equipment for two-meter operation.

For further details, contact *Icom America, Inc., 2112 116th Ave. NE, Bellevue, WA 98004; (206)-454-8155.* Reader Service number 486.

Jonathan Mayo KR3T
Media PA

THE AEA CP-1 COMPUTER PATCH

Many amateurs have joined the computer revolution in the past few years. The availability of inexpensive microcomputers has resulted in the appearance of approximately 100,000 of these units in ham shacks around the world.

As it comes, the home computer lends itself well to logging chores, dupe checking, and propagation prediction. All of these applications require software only. To realize the full potential of a computer in the ham shack, one or more hardware interfaces is required to safely interface the micro to the amateur-radio equipment.

Some of the most popular applications for a computer include sending and receiving RTTY, AMTOR, ASCII, and even CW. Numerous software packages are available to teach your computer how to speak these "foreign" languages. The best software in the world is nearly useless if the incoming signal does not accurately convey the received data.

The AEA people have designed the CP-1 Computer Patch to match virtually all makes and models of amateur transceivers and separates to most home computers. It does its job extremely well. AEA has been making code and RTTY readers for some time. The CP-1 is a logical extension of the technology developed in these units.

One of the first things you notice when you take the CP-1 out of the box is its relatively small size. The old vision of everything having to do with RTTY being big and bulky is finally dying. The style is very clean and makes a pleasing addition to the ham shack.

An exploration of the inside of the CP-1 reveals superior construction techniques. The circuit board has the look and craftsmanship of the highest-quality commercial gear.

Connection of the CP-1 is relatively simple. The detailed and easy-to-read instruction manual makes the task painless. A connection from the audio output of your rig is needed for reception. A cord from the CP-1 to the microphone jack of your radio will also be needed if you wish to transmit.

An external power adapter is provided with the CP-1. Often this is an extra-cost item with other interfaces.

With the CP-1 connected and some software loaded in your computer, you are ready to go! The controls on the front panel of the interface are straightforward.

After turning the power on, you need to select the shift you wish to use. Three push-buttons allow selection of a narrow bandwidth for CW reception, or a 170-Hz bandwidth for standard RTTY reception. In addition, a variable shift position allows reception of virtually any nonstandard shift up to 1000 Hz.

The center frequency of the bandpass filters in the CP-1 is also changed depending on your selection of CW or RTTY reception. In the CW mode, the filters are centered around 750 Hz, the frequency most CW filters in transceivers are tuned to. For RTTY, the center frequency is shifted up above 2125 Hz to accommodate standard RTTY audio frequencies.

Though the CP-1 will receive almost any shift, it is designed to transmit only 170-Hz tones. A simple modification outlined in the instruction manual will allow 850-Hz transmission if you need it for MARS or other work.

How well does it work? In side-by-side comparisons on regular amateur transmissions, the CP-1 often provides the best reception of even very weak signals. There are several notable things about the CP-1's performance.

Adjacent signal rejection is superb! Many computer interfaces fall a bit short in this category, but the CP-1 compares favorably to sophisticated terminal units. It is possible to tune to even a weak signal with a very strong signal nearby and realize virtually 100-percent copy.

An indication of the clean signal coming from the CP-1 is highlighted when tuning between signals, or when the frequency is idle with only background noise present. Many interfaces will try to interpret the random noise and signals as real data. The CP-1 provides a "quiet" output under most conditions, keeping the computer screen clear until a signal is properly tuned.

The tuning indicator provided on the CP-1 does a good job, performing almost as well as a tuning scope. For the purist, scope outputs are provided on the back of the unit.

No problems were encountered using the unit on transmit. Provisions are made to match the level and keying requirements of most equipment.

I tested the CP-1 with MBATEXT, AEA's software package, HAMTEXT and HAMSOFT from Kantronics, and numerous programs of my own design. It performed well with all of them.

If you are interested in copying commercial transmissions, the variable shift feature is a must. Most transmissions outside of the amateur bands occur at 425- or 850-Hz shift. The CP-1 adequately provides reception at these shifts. Adjustment of the variable shift control requires some learning, but the instruction manual provides the instructions you need to properly tune the CP-1 in this mode.

The AEA CP-1 has a suggested list price of $239, though it is currently being offered by many dealers at a much lower cost. Additionally, the CP-1 is sold in packages with AEA software at an even greater savings for the packages.

If you are looking for an excellent dollar value in a computer patch, the CP-1 is hard to beat. It is highly recommended.

For more information, write *AEA, PO Box C-120, Lynwood WA 98036.*

Jim Grubbs K9EI
Springfield IL

DX-1 PROPAGATION SOFTWARE FOR THE APPLE

Knowing when and where to listen for DX is half the battle in logging a new country or prefix. If you own one of the Apple II series of computers, the DX-1 program from DX Enterprises, 5861 Bridle Way, San Jose, California 95123, can provide you with very detailed propagation information.

DX-1 is much more than just an implementation of the popular maximum usable frequency program. It provides at least one feature that no other propagation program that I have seen includes.

For those of you who are interested in the programming aspects of computing, you may find it interesting that DX-1 is written using the Pascal language. Virtually all of the other propagation programs are written in some version of Basic. Pascal is a structured language that its proponents feel allows programming in a very logical fashion. No program line numbers are used.

The DX-1 package takes a machine with 64K of memory and one disk drive. Loading the package takes something just under four minutes. The long load time occurs because the Pascal language must first be loaded in, and then information on more than 400 unique radio locations is absorbed by the computer.

Operating the program is made easier by reading the manual as you input the requested information. Numerous examples are contained in the twenty-page book that accompanies DX-1.

Rear-panel view.

You will need to know your latitude and longitude. Unlike similar programs, DX-1 does not store this information anywhere for you. This was considered a minor inconvenience.

Selecting the target area is quite easy. You may input coordinates for a specific location, or you may use the information contained in DX-1 to search by country. It's not even necessary to know exactly how to spell the target area. For example, Sri Lanka was found by asking DX-1 to search for SRI. If the computer is unable to outguess you, backward and forward scrolling through the list will locate the country you have in mind.

As soon as you input your location and the date, the program calculates sunrise and sunset for your location. Be careful! The times given are in GMT (or UTC if you prefer) *not* local time! A similar calculation is made on the target area.

As with all MUF programs, you will need the 10.7cm solar-flux reading. DX-1 also requires the geomagnetic "A" index. Both are available at 18 minutes past the hour from WWV. The additional use of the A index and other calculations allow DX-1 to calculate a "quality" factor for the path.

After inputting the information, it's time to sit back and wait about half a minute for DX-1 to do its thing. The information is displayed on the screen in table form. If desired, the screen information can be sent to your printer for a more permanent record.

DX-1 will also calculate the frequency of optimum transmission (FOT) when requested. This, too, can be sent to the printer.

Additional "nice-to-have" information, such as beam headings for short and long paths, distances for both, and the prefix for the target area, is displayed.

The area in which DX-1 shines, if you will pardon the pun, is in greyline calculations. Old-time DXers and SWLs know that enhanced conditions exist between two points when both are undergoing sunrise or sunset at the same time. DX-1 will tell you what to look for during these conditions on any given day.

Even the width of the greyline area can be specified. Normally a 15-degree width is adequate. Since there are 24 hours in a day and a circle has 360 degrees, the 15-degree width corresponds to a one-hour window, or 1/24th of a day.

Greyline calculations are complex and time consuming. It takes about five minutes for DX-1 to do the job. When selecting greyline calculations you must specify whether you want the output to go to the screen or to the printer. You cannot go back later and print what you saw on the screen without DX-1 going through all of the calculations again.

The programmers of DX-1 deserve some applause for taking the time to format the printout of the greyline calculations. A form feed is issued so nothing is typed on the perforations. The headings are also duplicated at the top of each page. A nice touch!

DX-1 was judged to be of great value to the serious DXer. Some of the times involved in loading and calculating suggest that DX-1 might be better suited to everyday operations rather than a contest situation where you might be using your computer for other things, like logging for example, at the same time.

The absence of a graph-type display of the MUF and FOT is a minor flaw in DX-1. The information provided in table form is of course just as accurate, perhaps even more so.

If your interests are a bit more routine, a somewhat more compact version, minus the greyline-calculation option, is available. It is called DX-2 and was not reviewed.

Take a byte out of propagation prediction! DX-1 for your Apple computer will help do the job.

For more details, write *DX Enterprises, 5861 Bridle Way, San Jose CA 95123.* Reader Service number 485.

Tim McDonough WD9EDT
Springfield IL

NEW PRODUCTS

PACKET RADIO CONTROLLER FROM AEA

Advanced Electronic Applications, Inc., has announced the introduction of the Model PKT-1 packet radio controller through an arrangement with Tucson Amateur Packet Radio, Inc. (TAPR), Tucson, Arizona. AEA started delivery of the PKT-1 to its dealers in June.

The PKT-1 is a packaged and warranted version of the well-known TAPR do-it-yourself kit board with version 3.1 software, and includes application assistance and a year's conditional warranty. More than 1000 users of the TAPR kit board now exist throughout the world.

Packet radio is a burst mode of data or text transmission utilizing AFSK, FSK, or PSK modulation. On VHF it runs at 1200 baud typically, and uses CRC error checking, ensuring an extremely low error rate. Multiple users may share a simplex or duplex channel simultaneously on a time-share multiplexed basis.

Any packet station using the PKT-1 may operate as a store-and-forward repeater (digipeater) for someone else's transmission while concurrently functioning as a regular packet station. Up to 8 digipeating stations may be used between two terminal stations. Digipeating allows routing the transmission path around physical obstacles blocking a line-of-sight radio path and allows extending the link beyond line-of-sight distances.

For more information, contact your closest AEA dealer, or *AEA, PO Box C2160, Building O&P, 2006-196th SW, Lynnwood WA 98036-0918; (216)-775-7373.*

AMTOR CONVERTER FROM INFO-TECH

The new Info-Tech M-44 AMTOR converter allows most RTTY terminals to be used on the recently-approved AMTOR RTTY mode. Interface to the terminal is via serial TTL or RS-232 levels, and either ASCII or Baudot terminals may be used.

The unit also features a built-in modulator and demodulator with pre-filter, full-time ATC, and two transmit buffers. All control of the M-44 and transceiver is by simple commands entered via the terminal keyboard.

This converter is American designed and manufactured and will operate in the ARQ, FEC, and ARQ-monitor modes.

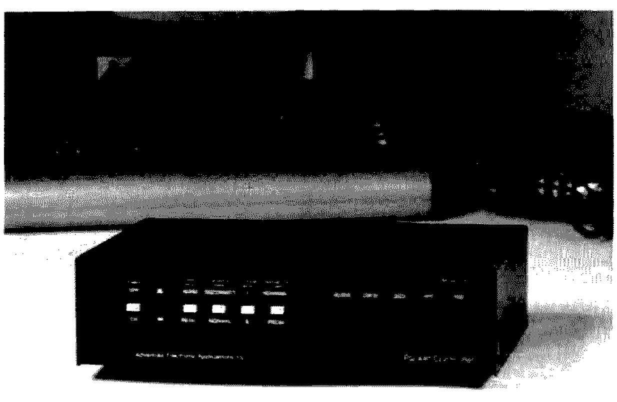
For more information, contact *Digital Electronic Systems, 1633 Wisteria Court, Englewood FL 33533.* Reader Service number 478.

REGENCY ELECTRONICS 20-CHANNEL SCANNER

Regency Electronics, Inc., now offers a 20-channel programmable scanner with complete, continuous coverage from 25 to 550 MHz. This receiver has microprocessor control for direct keyboard entry of frequencies. The Regency MX-5000 is available at participating Regency Electronics dealers.

The MX-5000 scans two to twenty channels automatically, or channels may be selected manually. Its wide coverage includes high and low VHF, UHF, and UHF "T" for police, fire, emergency services, business band, marine radio, radio-telephone, and National Weather Service broadcasts. It covers VHF aircraft, five amateur-radio bands, and TV audio and

Info-Tech's M-44 AMTOR converter.



The PKT-1 packet radio controller from Advanced Electronic Applications.

The Regency Electronics' 20-channel scanner.

FM broadcast. Any frequency can be selected directly at the keypad; each keypress is verified by a beep. A memory-backup system saves frequencies in memory even if power is disconnected, yet no battery is required.

Any frequency can be programmed into priority channel one and sampled at approximately two-second intervals; if active, it automatically overrides any other signal. Any selected channel or channels can be "locked out" and omitted temporarily from the scan. A scan-delay feature can be invoked to avoid missing callbacks; this feature delays resumption of scanning for approximately two seconds after a transmission ends. A choice of two scan speeds samples channels as rapidly as five per second or at a slower rate.

The MX-5000's search feature helps locate unknown or "hidden" channels within any specified frequency range; it searches for active channels in (selectable) 5-, 12.5-, or 25-kHz increments; the mode of reception (AM, wideband or narrowband FM) is also selectable. When a signal is received, its frequency is displayed on the digital readout. Search may then be resumed, or the new frequency stored in one of the 20 scan channels.

The multi-function digital display shows both channel number and frequency (plus MHz or kHz) when scanning (just frequency while searching, plus the receive mode and search frequency increment), and whether the priority mode has been selected or if the displayed channel has been locked out. Error messages are displayed in the event of invalid keyboard entries. A built-in 24-hour digital clock offers the time whenever the MX-5000 is plugged in. The display is side-lighted for easy nighttime legibility.

A slanted front panel offers easy visibility and operation. A keyboard lock switch can disable the keyboard to prevent inadvertent entries. Dual-concentric volume and sqelch controls help tailor the audio delivered to the built-in speaker or external speaker jack. An external antenna jack allows the addition of a full-size antenna for improved reception; an attenuator switch (−10 dB) helps prevent overload from strong local stations in highly congested signal areas.

The MX-5000 comes with a telescoping antenna, wall-mounted ac power supply, a 12-V-dc power cord for use in a car or other vehicle (where not prohibited by law), and mobile-mounting bracket. It measures 5.4"W × 3.1"H × 7.9"D(138 × 80 × 200 mm).

For additional information, contact *Regency Electronics, Inc., 7707 Records St., Indianapolis IN 46226-9989; (317)-545-4281.* Reader Service number 483.

TRAINING TAPES FOR CODE AND THEORY

Radio School, Inc., founded by Gordon West WB6NOA, is offering a large selection of code and theory training tapes to the amateur-radio community. Gordon West has also produced technical tapes dealing with antennas, grounding techniques, and maritime-mobile installation.

Over 700 free volunteer-examiner tape sets were mailed recently to instructors throughout the country, containing FCC-type volunteer-examiner code tests at 5-, 10-, 13-, and 20-word-per-minute levels. There were ten different versions of each tape to prevent students from memorizing them.

Radio School offers over 30 individual one and one-half hour long code cassette speed-building courses. There are also over 20 individual tapes covering theory examination preparation, and 10 tapes dealing with amateur radio equipment installation techniques.

The tape courses are in stereo; students can listen to both channels in the car, but separate the voice channel out when listening to code practice at home with a pencil. Any tape player with a balance control can easily fade out the voice channel. When played on a mono tape recorder, the student will hear both channels.

Radio School was first to offer complete 4-cassette theory courses covering the new FCC questions from Novice to Extra. These theory courses also feature live sounds of amateur radio operating to assist the student in recognizing some of the topics discussed on the tape.

The Gordon West Radio School tapes are available directly from the School. For a catalog or more information, contact *Radio School, 2414 College Drive, Costa Mesa CA 92626.* Reader Service number 477.

THE DAVLE TECH DESOLDERING STATION

The model SA-4 desoldering station from Davle Tech, Inc., features a self-contained high-volume vacuum pump for easy removal of solder from through-hole and multi-layer applications. Additional features include trigger-actuated pistol-grip design, "no-clog" system with transparent solder collector, and easy collector cleaning; grounded for use with delicate MOS and CMOS components, it has a low-maintenance design and a specially-processed long-life nozzle.

The SA-4 is available for either 115-V or 230-V 50/60-Hz input, and is compact and lightweight for portability. A handy tool holder is built into the control unit. Includes .039"(1.0 mm) nozzle. Optional nozzles available from .031"(0.8 mm) to .063"(1.6 mm) diameter.

For more information, contact *Davle Tech Inc., 2-05 Banta Place, Fair Lawn NJ 07410; (201)-796-1720.* Reader Service number 481.

THE VOICE PAK FROM SPECTRUM PROJECTS

Spectrum Projects has introduced a CoCo voice synthesizer, the Voice Pak, that uses the Votrax SC01 synthesizer chip in a cartridge-style pak. It provides an unlimited vocabulary with automatic or user-supplied inflection, a variable voice-level adjustment, plus four programmable levels of pitch. With a single line of code, the Voice Pak adds speech to any Basic program in minutes.

The system comes complete with a user instruction manual, software cassette with demo programs, text-to-speech scanner, and a "Word Manager" that constructs custom user dictionaries. The unit is fully assembled, tested, and ready to plug in and talk. The Voice Pak allows any prompting application in education, speech therapy, games, robotics, or security.

For more information, contact *Spectrum Projects, 93-15 86th Drive, Woodhaven NY 11421; (212)-441-2807.* Reader Service number 482.

ICOM'S MULTIMODE BASE-STATION TRANSCEIVER

Icom announces the IC-471H 430–450-MHz transceiver with 75-Watt transmitter, low-noise PLL circuitry, and high-sensitivity receiver.

Standard features include 75 Watts rf output, FM, SSB, CW modes, 32 full-function tunable memories (storing frequency, offset, offset direction, and tones), 10-Hz tuning increments, 1-MHz up/down buttons, scanning of memories, memory modes, or band, all-mode squelch, and dual vtos. Its size is 4-1/2" (H) × 11-1/2" (W) × 13-1/4" (D).

The IC-471H uses 12-V-dc power and may be supplied from an external source (IC-PS15 or IC-PS30, optional) or from an optional internal ac power supply (IC-PS35). Other optional features include an IC-AG35 switchable mast-mounted preamplifier, UT15S encoder/decoder (PL encoder is standard), IC-CT10 computer interface, IC-EX309 computer-interface connector, and IC-EX310 voice synthesizer.

For more information, contact *Icom America, Inc., 2112 116th Avenue NE, Bellevue WA 98004, (206)-454-8155.* Reader Service number 476.

BV ENGINEERING'S FIRST SOFTWARE

BV Engineering has announced the first three products in what will be an entire line of professional software sharing common data files.

ACNAP is an ac network-analysis program that analyzes electronic circuits consisting of resistors, capacitors, inductors, and active components such as transistors and operational amplifiers. ACNAP will work with component tolerances to perform Monte-Carlo, Sensitivity, and Worst-Case analyses.

PLOTPRO is a general-purpose scientific graph-printing program which makes linear/log/semi-log graphs on any 80- or 132-column printer. PLOTPRO supports vertical and horizontal formats, two Y axes, multiple plots, auto-scaling, labeling, and grid lines.

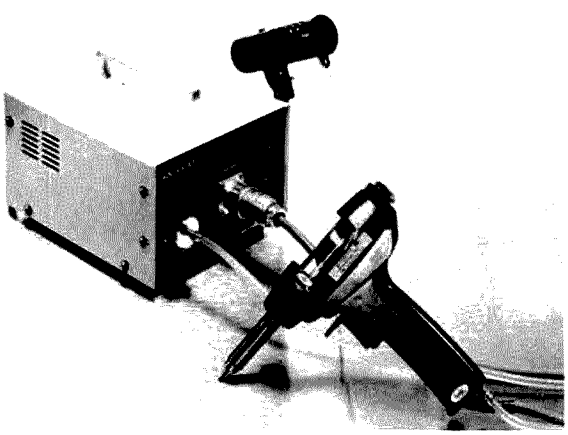
SPP is a general-purpose signal-processing program that analyzes linear and nonlinear systems in the frequency domain and in the time domain. SPP supports FFT and inverse FFT, LaPlace transforms, transient analysis, and a complete set of signal generation and manipulation routines. All programs available for CP/M, MSDOS, PCDOS, and TRSDOS.

For a free flyer and further information, contact *BV Engineering, Box 3429, Riverside CA 92519; (714)-781-0252.* Reader Service number 480.

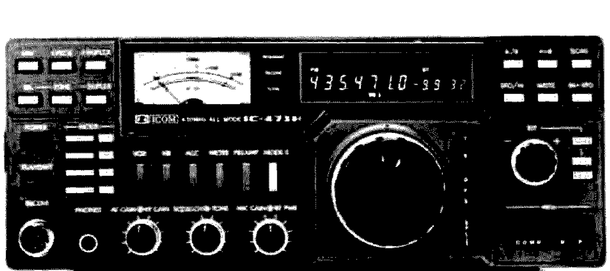
CMC COMMUNICATIONS VOICE-OPERATED SQELCH

CMC Communications is offering a voice-operated squelch on a small circuit board for mounting inside most HF/SSB transceivers and receivers. The VOS requires that different and select components of the voice spectrum be present at the same time to operate. It ignores heterodynes, the Russian woodpecker, and noise regardless of level, yet it is extremely sensitive to weak signals when the human voice is present. All adjustments are made at the factory and a remote on/off switch is provided. Simple connections are made to the speaker leads and 9 or 12 V dc. This product is used extensively worldwide in commercial marine, land, and military systems.

For further information, contact *CMC Communications, Inc., 5479 Jetport Industrial Blvd., Tampa FL 33614; (813)-885-3996.* Reader Service number 479.



Desoldering station from Davle Tech, Inc.



Icom's multimode base-station transceiver.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

BAKER AND HOWLAND: ANOTHER NEW ONE

Another new country will soon be added to the ARRL DXCC Countries List: Baker and Howland Islands, located in the middle of the Pacific Ocean. Let's look at the process whereby new countries are added to the DXCC list by following the saga of the latest country on that list.

As with many "new ones" in modern DX history, the new country of Baker and Howland Islands rises out of the ashes of a former DXCC country which will be deleted from the DXCC roles when Baker and Howland is added. The old DXCC country of Baker, Howland, and the American Phoenix Islands will no longer exist, and future contacts with amateurs in that region will count for other DXCC countries.

The Baker-Howland story begins in the 19th century when Great Britain claimed the Line Islands and the Phoenix group. These are widely-separated, small coral atolls near the equator, south and southwest of Hawaii. The total land area in this region is less than 20 square miles. The atolls were known primarily for their extensive bird populations, which produced what was the chief export of the islands in the 19th century, bird guano.

Great Britain was not the only country to take an interest in these islands. The United States claimed the islands by right of discovery, and even issued some mining permits to guano collectors. From 1937 on, some US personnel lived permanently on Canton, an island in the Phoenix group.

In 1939, Great Britain and the United States sat down to resolve their differences in this area. Neither country was willing to give up its claim to the islands of the region, so a compromise was reached whereby *both* countries would administer the birds and their nests. This joint administration recognized the claims of both countries. Since the bottom had fallen out of the guano market, no one seemed particularly interested in the area.

Our little disagreement with Japan (i.e., WWII) changed that, and the US built and maintained a major military base on the largest island of the region (and the largest coral atoll in the world), Christmas Island. The joint administration of some of the islands in the Phoenix group continued until 1970, when the US Air Force took over control of Canton Island (where it had a military base). But the agreement with the British continued.

So matters stood until 1979, when the Republic of Kiribati was born. Kiribati stretches several thousand miles across the central Pacific from the Gilbert Islands in the West to the Line Islands far to the east. With this change, the British relinquished their claim to the islands in the area and gave their portion of control to the new Kiribati Republic.

Meanwhile, the joint administration of Canton Island in the heart of the Phoenix group created an interesting amateur-radio situation. A ham station on Canton could operate under US rules with a KH1 callsign (formerly KB6 before the FCC started messing around with callsigns), or that same station, in the same location, could operate under British control with a VR1 call.

There are very few spots in the world which count for more than one DXCC country at one time. (A Peace Park on the border between Norway and Sweden is the only other which comes to mind. Anyone know of any others?) A ham on Canton could hand out a DXCC contact for the British Phoenix Islands, and then, by switching calls, could hand out a QSO good for the American Phoenix DXCC credit.

The independence of the Kiribati Republic didn't change the basic nature of this amateur-radio anomaly; only the callsigns changed. The Kiribati Republic began issuing T3 calls, including T31 calls for the Central Kiribati Republic (the Phoenix Island group). Contacts from Canton Island could still count for either the American Phoenix DXCC credit or for Central Kiribati T31.

Eric Sjoland SM0AGD operated from Canton a couple of years ago and helped knock both KH1 and T31 off the Most Wanted List. Eric operated under his KH1 call one day, and then switched over to his T31 call the next.

Meanwhile, even while Eric was making thousands of DX QSOs from Canton, the Northern California DX Foundation was laying the groundwork for a new DXCC country.

Soon after the Kiribati Republic was created, the United States signed a Treaty Of Friendship with the new country. In this treaty, the US renounced its claim to the islands in the Phoenix group, including Canton. The Air Force had decided that it no longer needed its Canton base, and therefore closed the base at about the same time.

The workings of the US government are slow, and it was almost four years before this treaty was ratified by the Senate. Once President Reagan signs the treaty, the US no longer has any territorial claim to the islands and loses the right to issue amateur-radio licenses for the region.

The amateur-radio implications of the treaty go beyond callsigns. The US is retaining its claim to the tiny islands of Baker and Howland, just north of the central Kiribati Islands. These two islands were never under joint administration, nor were they part of the Republic of Kiribati.

But the DXCC country is defined as Baker, Howland, and the American Phoenix Islands, including Canton. When the treaty is signed, Canton (and the other American Phoenix Islands) will no longer be under US jurisdiction. So the majority of the present DXCC country will vanish.

Members of the Northern California DX Foundation recognized that the old DXCC country could not continue unchanged. As they saw the situation, the old country of Baker, Howland, and the American Phoenix Islands should have been deleted from the DXCC list when the American Phoenix Islands reverted to sole ownership by the Kiribati Republic. Further, the islands of Baker and Howland, now cast off from the larger, populated Phoenix Islands, were a prime candidate to become a new DXCC country.

The NCDXF carefully assembled the documents detailing the administrative changes in the region and submitted a request to the ARRL DX Advisory Committee to delete the old DXCC country of Baker, Howland, and American Phoenix and add a new country of Baker and Howland Islands.

The carefully-reasoned and well-written submission to the DX Advisory Committee argued that with the loss of the American Phoenix Islands from the old DXCC country, that country should cease to exist. To support their request, the NCDXF cited several precedents in DXCC history in which DXCC countries losing much of their territory have been deleted from the DXCC list. These favorable precedents included the deletion of Germany and the establishment of two separate countries of East and West Germany. The NCDXF also cited previous deletions in the 1960s in Africa (as the French colonial holdings became independent).

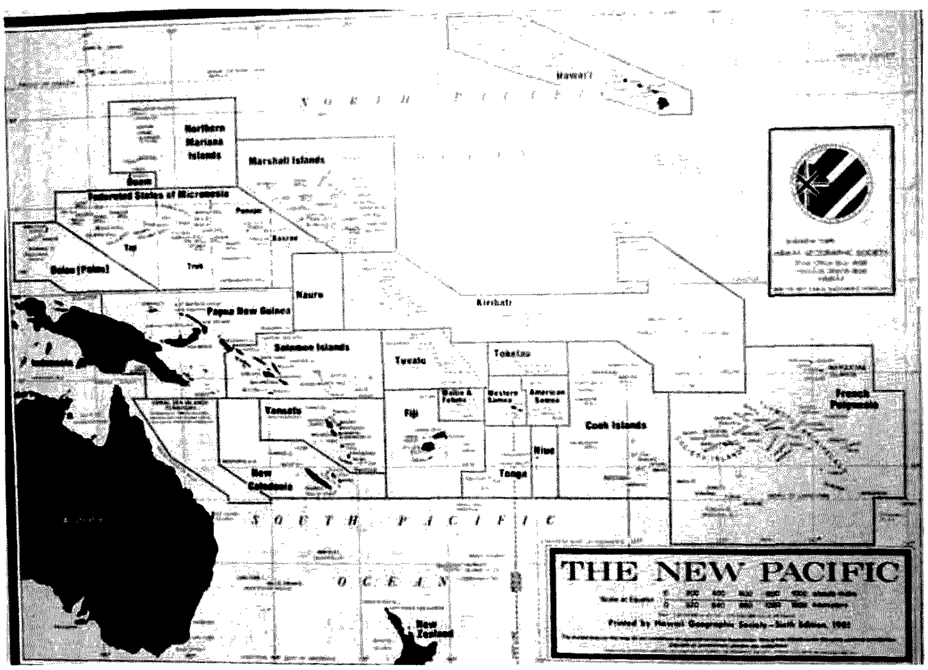
Of course, the DXCC program is not known for its consistency. The DXCC list is full of conflicting precedents. There were several cases in which DXCC countries lost significant portions of their land area and were not deleted from the DXCC list.

The NCDXF bolstered their argument with detailed land-area charts, supporting their claim that the DXCC country would lose 90% of its land area and 100% of its human population when the US gave up its control of the Phoenix group.

The argument proved telling, as, in late spring of this year, the DX Advisory Committee supported the NCDXF request. The ARRL Awards Committee will most likely approve this recommendation, and another DXCC country will join the ranks of the deleted.

Concurrent with this deletion is the recommendation to create a new DXCC country of Baker and Howland Islands. After all, these islands would no longer be part of the now-deleted country. On the other hand, the islands are too far from any other US island in the region to be part of a previously-existing DXCC country. The only option left is to establish a new one composed of the two islands, and such was the recommendation of the DXAC.

The tiny islands join several other minute and difficult-to-reach US possessions in the region. Just north of Christmas Island (in the Eastern Kiribati Republic) are the islands of Palmyra and Kingman Reef, both of which are separate DXCC countries. The difficulty and expense of reaching these isolated islands has kept them high on the Most Wanted List. And an unfortunate crash landing of a DXpedition airplane on Palmyra has caused the owners of the island to stop issuing landing permission for DXpeditioners to the island. Tiny Kingman Reef is only a



Baker and Howland Islands are located directly above the word "Kiribati" in this photo.

few feet above the waves and therefore requires a major expedition and good weather for a significant radio operation. Hence, Kingman Reef and Palmyra are among the more difficult countries to work in the Pacific.

Baker and Howland will certainly fall into this category. The islands are now a wildlife refuge under the control of a Department of Interior unit. In addition to the usual problems of transportation, generators, gear, food, and shelter, any DXpedition to the new country of Baker and Howland will have to comply with the requirements of the Interior Department not to disturb the wildlife.

The NCDXF hopes to mount the first DXpedition to this new country sometime in the near future. Given the transportation problems in the area, the DXpedition will be a major one. There are no scheduled air flights in the area except to Christmas Island (well over a thousand miles away). Even locating Howland will be a challenge, as the island is surrounded by more than 300 miles of open ocean.

One well-known individual had trouble doing just that. It was Howland Island that Amelia Earhart was attempting to locate on the last, and fatal, leg of her round-the-world flight. The last the world heard of this intrepid aviatrix was a garbled radio transmission in the vicinity of Howland, and then silence. Hopefully, the NCDXF team will have better luck finding their destination.

So the next time you hear a station from KH1, the odds are you haven't worked it before. Jump into the pileup and be one of the fortunate amateurs who works a new one on the first operation from KH1. Special thanks to Jim Maxwell W6CF, secretary of the Northern California DX Foundation, for this information.

RTTY LOOP

Marc L Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

Labor Day finds us looking forward to the kids returning to school, the new fall television season, and cooler weather to work on that new antenna system. Nonetheless, many of you have offered this thought or that on your own RTTY setup. Let's see what's going on.

SSG Gary Kohtala DA2XF is using a Commodore 64 and is interested in RTTY mailboxes. He questions whether the Apple program, Super-RATT, published by Universal Software Systems, is available. Apparently he has tried to contact USS without results. Well, sorry to say, Gary, I have not seen any ads from the firm in several months. I just don't know their condition. If anyone can help Gary out, drop me a line and I will forward the information to him.

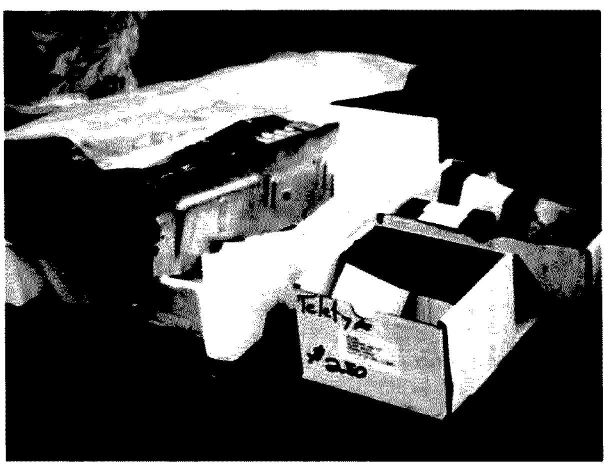
One ham who is operating a Commodore computer as a RTTY mailbox is Bob Kling K8GJL. He notes that several amateurs are operating through the 146.25/146.85 repeater in Vandalia, Ohio. While usual operations are at 60 wpm Murray, ASCII is in use at 110 baud for program transfer. Bob would like to see listings of other RTTY mailboxes in this column. So would I, Bob, but few of the system operators have sent data to me here at WA3AJR. I promise to publish all the listing and operating information I receive; just send it to me at the above address and watch for it about three or four months later in this column.

By the way, Bob, you mention in your letter that the program you are running is in Basic. How about sending along a copy and we will run it for other VIC-20 users to implement at their stations? It might even be adapted easily to other small computers. Let me hear from you.

One reader who indicates his interest in the VIC-20 on RTTY is Thomas Zeltwanger KG3V. Tom states that he has several programs available at nominal cost to run RTTY on the VIC-20. Interested amateurs should write Tom at PO Box 62, State College PA 16804, enclosing an SASE and indicating they desire information on the VIC-20 programs mentioned in "RTTY Loop."

Jim MacMurray KA2DWH is the first to write me asking about using the new MicroCoCo (Radio Shack MC-10) computer on RTTY. This computer uses the 6803 CPU, which is an intermediate between the older 6800 and the advanced 6809 which runs the "standard" Color Computer™ (TRS-80C). I would think, offhand, that any of the older 6800 programs published here in the past would run if the ROM calls were changed to use analogous routines in the system monitor ROM. I have scanned several of the specialty magazines such as *HOT CoCo* and not found anything specific to the MC-10. If any readers have interfaced their MicroCoCo to RTTY, let us all know about it.

One of our regular fans, Earl Morris N8ERO, passes along two points. First of all, his first name was misspelled in an earlier column; sorry about that Earl. With my name spelled as unusually as it is, I am rather sensitive to that and try to keep the spelling straight. Earl's question relates to the several types of ASCII that are sent on various circuits. He asks if data bits should number seven or eight, one or two stop bits, parity or not parity, or just what is the standard?



An anachronistic offering.

Well, if telephone bulletin boards are any example, there just isn't any. There are some points to be made in favor of each choice; let me tell you mine. Let's deal with parity first—most terminals ignore it. Therefore, so should you. Now, I know that parity checking is very useful, and I do use it myself on noisy lines, but if you have to deal with the great variety of terminals out there, ranging from mechanical Teletype™ machines to whiz-bang video terminals, the only practical solution is not to require parity.

Similarly, the pure ASCII code is seven, not eight bits, and unless you are transmitting data such as with an XMODEM-type transfer or graphics, seven data bits should be enough.

Now, as far as stop bits go, you should have two different schemes. When transmitting, send with two stops; when receiving, require only one. That way minor differences in speed, entirely possible with the variety of terminal programs in use, will have a bit of slack in the receiver. This was one feature of an old computer tape-storage scheme pioneering by W2NSD, and I still think it has merit. Those are my thoughts, let me hear all of yours.

I have received several letters asking for a simple AFSK generator. Fig. 1 is one such design which I have seen in various forms over the past few years. This one is adapted from an article by Clay Abrams K6AEP in the September, 1983, issue of *73*, on a RTTY program for the CoCo.

As the circuit accepts input using the RS-232 standard, let me say a few words about that. The RS-232 standard sets up many parameters for a digital signal that will be used to transmit information. Although there is much more to be specified than this, all we are going to concern ourselves with here are the voltage levels and polarities that define Mark and Space. The Mark signal shall be a negative voltage, less than −3 volts, and the Space shall be a positive voltage, greater than +3 volts.

To clarify that, with common transistor-transistor logic devices (TTL), a Mark signal is normally +Vcc, nominally +5 volts, and a Space is at ground potential, or 0 volts. With an RS-232 signal, this positive-negative relationship is reversed and the Mark is the negative signal, while the Space is the positive.

Now, I use three volts as the level, which is oversimplifying a great deal. The actual level can vary within a window from around two volts to about twelve volts. In practice, plus and minus five to eight volts should be adequate. This simple design with one chip and a few external components should be enough to put you on RTTY in a short while.

I am pleased to announce this month, the availability of the fourth in our series of RTTY reprints. For those who came in late, these are rewrites of material published in the early years of "RTTY Loop" on basic RTTY concepts. They have been condensed where need be and expanded in other areas, and are available from this address at $2.00 per issue, and an SASE. If you would like a list of topics published so far, just send an SASE to me and I will be happy to send that out. Feel free to include other comments or topics for the column with your requests; I read them all and am always delighted to hear from you.

While I'm at it, I appreciate some of the general comments offered by Bill Spann, in Mooresville, Indiana, Edward Radtke WA4BQE, in Louisville, Kentucky, George A. Collier, Jr. W5GME, in Durant, Oklahoma, Bill Pascale W8JED, in Oroville, California, Thomas Page, DDS WB7WQI, in Salt Lake City, Utah, and the many others who send me general comments, questions, and jabs which keep my keyboard popping. As I said a while back, I try to answer all mail received as soon as I can. All you need to do is enclose an SASE or sufficient US funds or IRCs for foreign countries, and send the letter to me at the address at the top of this column. While I don't publish all the questions received, I will try at least to acknowledge you in print. Of course, because of the lead time of the column, you should receive your reply before you see your name here!

In response to the clamoring for more photos from the WA3AJR camera, here is another of the sights from the 1984 Baltimore Amateur Radio Club Hamboree and Computerfest. One of the most anachronistic tables I saw was offering two items: eight-inch disk drives, and cloth ribbons for a Model 15 Teletype. The old and the new, in juxtaposition and harmony. Isn't that what RTTY really is, though? I think so, and so will you, as you continue to follow the latest here, in "RTTY Loop."

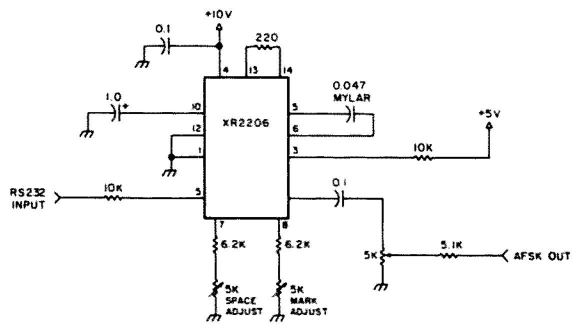


Fig. 1. A simple AFSK generator.

73 INTERNATIONAL

from page 60

is an excellent opportunity for amateur radio to obtain some free publicity, albeit restricted for the present.

One of the alternative program items at the recent conference attracted an unusual and varied following. Jazzercise, your reporter observed, attracted about 14 participants, including an attractive demonstrator, as well as about 50 "lookers" observing the merits, etc., of this type of exercise activity. I'm not too sure whether the lookers were observing "how" or "wow!"

In the Hidden Tx Hunt (Fox Hunt) contest, won by ZL3TLB's team, 3rd place went to one of our paraplegic amateurs, Bill ZL2BMQ, and his "pusher," George. As all the other competitors were on foot, Bill felt he was slightly advantaged because he was "mobile."

One of the 20 teams entered in the Mobile Rally, ZL2AA, the Gisborne team, had the only mobile antenna farm in the rally, supported by a mini-bus; the vehicle had at least a dozen aerials on or around it and I'm told the extra drag increased the gasoline account considerably.

WARO, the Women Amateur Radio Operators Club, elected Jeanne ZL2BOD of Hawera as their president for the ensuing year. There were about 35 WARO members at the annual general meeting on Sunday morning.

The Amateur Radio Emergency Corps (AREC) annual general meeting was attended by between 60 and 70 members, and various items were discussed including the Civil Defense Communications systems which are in the process of changes, as and when finances and equipment become available.

The AMSAT session included talks by Jim KA7APJ, Ian ZL1AOX, and others, giving very interesting accounts of AMSAT activities, as well as showing videos of some AMSAT happenings. There was also a video of the "Amateur in Space" showing continuously during the breaks in the conference sessions, and this attracted large crowds at every showing.

The VHF Forum chaired by Vaughan ZL1TGC and Jamie ZL2PU attracted about 90 interested members, and the subjects discussed ranged from repeater uses and abuses to packet radio. The VHF scene in ZL is very much alive and has a very good following, particularly amongst the younger and extremely talented, technically-inclined amateurs. Some of the technical features these amateurs are including in their work and projects make an old-timer's mind like mine boggle.

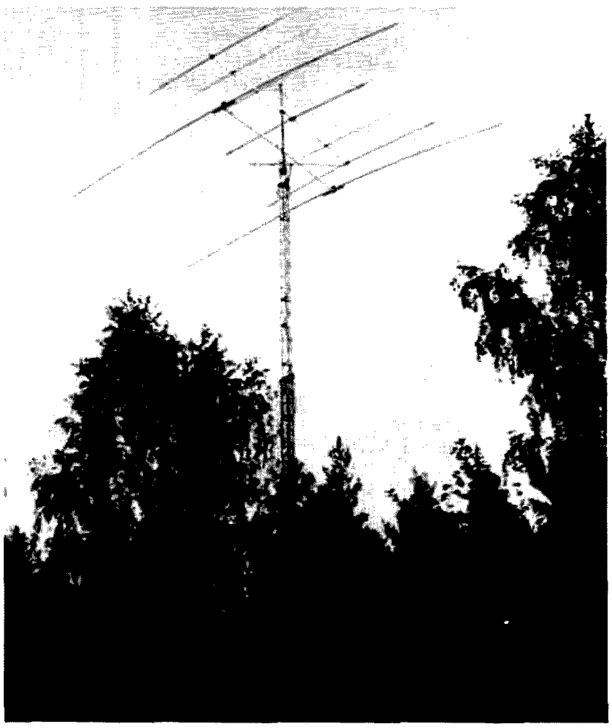
The Old-Timers Club (Quarter Century Club) also held its annual meeting on Sunday morning; about 30 members attended to discuss the business of the club. During the past year, three members received their 60-year certificates, and 33 members gained their 50-year certificates. These certificates are issued by the OTC for being licensed for the period concerned.

On the other side of the ledger, there were 15 Silent Keys recorded in the annual report; the OTC has a total membership throughout ZL of 480 as of the date of the annual meeting.

The Mobile Rally attracted entries from 20 teams and created the usual interesting and amusing incidents. All teams completed the course in good time although several got lost here and there. One team resorted to asking a policeman for directions, only to receive a very facetious reply, the officer of the law being more interested in the strange vehicle with several aerials attached thereto. The rally was conducted on three frequencies, 80, 40, and 2 meters, and consisted of three parts, operating, navigating the course against the clock with check points, and spotting detailed things from the clues given in the instruction sheet. Space does not permit listing the results, but the event was extremely successful, and I'm told there were no strained relations between team members and/or XYLs/YLs as a result of those differences of opinion which do inevitably occur on mobile rallies.

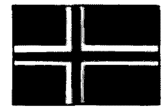
AN E-M-E FIRST

On February 18, a first for ZL was achieved when Graeme ZL3AAD, Christchurch, and John ZL2AQE, Wellington, made the first 432-MHz internal random Earth-Moon-Earth QSO. This contact was not prearranged as many E-M-E QSOs are. Graeme was using his 6-meter dish and John an array of 8 yagis. The straight-line distance between Christchurch and Wellington would be about 300 miles.



Antennas rising from the forest at LA7ZO's log cabin QTH.

Tore LA7ZO at his home QTH.



NORWAY

Bjorn-Hugo Ark LA5YJ
N-3120 Andebu
Norway

Well here we go again, folks. I'm sincerely sorry for not being able to supply any columns for a while, but this is because of illness, so you must forgive me.

Since my last, there has been quite some activity, DX-wise, and for me, the opportunity to work Kermadec Island was surely top drawer. This expedition went smoothly, as always. These guys surely do know how to handle a pileup. They proved that years ago. They are so professional that they should not be doing anything else besides giving us "New Ones." Let that be the honorable praise due them!

If the DXpedition to Kermadec was the high point, the opposite was when the news reached us that the Clipperton team was not able to go because of some unfortunate circumstances. We sincerely hope they will be able to do it again in a not too far off future.

What will I do when I've worked them all? Isn't it great to have something to look forward to!

This time I would like to present to you another friend of mine, Tore Egeberg LA7ZO. Tore has just made it into his 61st year, and is newly retired from his occupation as a 1st officer in the Scandinavian Airlines. His home QTH is situated near the Oslo fiord, around 15 miles south of Oslo. But his main operation point is at his very cozy log cabin near the lake of Kroederen, 13 miles NNW of Oslo. Facing the large lake, it is no wonder that his other hobby must be fishing. He just loves it, and rumors say he loves that more than DXing.

Tore was first licensed in 1971 and has ever since been very interested in DX. His standing in DXCC is 307 phone as of February 1, 1984. He also earned the 5-band DXCC, and was no. 4 in Norway to receive 5-band WAZ.

His home QTH, a two-story house on a 1/4-acre lot, is situated at an altitude of 100 meters topped with a 20-meter tower, a TH6DXX, and a 40/80-meter delta loop. His main operating QTH, the small log cabin, at an altitude of 160 meters, looks rather tiny beside the 30-meter crank-up tower keeping another TH6DXX and a Mosley 2-element yagi for 40 meters. Guy wires are, of course, antennas. Two slopers for 80 meters are giving him a tremendous signal on that band as well. He does, of course, have an additional spare antenna, an 18AVT with a lot of radials, and the tower also supports an inverted-V for 80 meters, up 23 meters for local (European) QSOs only. At home he's running a Yaesu FT-980 and a Drake TR7-line, and an SB-200 linear. At his cabin he has a Yaesu FT-902DM, a Swan 500 as backup, and an NCL-2000 linear. No wonder you hear him booming through the pileups.

Unfortunately, right behind his cabin a mountain rises up to 600 meters, and that direction is his very weakest point. At least there you can beat him in the pileups! But the combination of the two QTHs gives him the most out of everything, so he has, as you can see, really made his callsign heard a few times from both places.

Tore is one of those guys who fixes everything himself, and he seems to be very occupied at this time by restoring old

cars and (of course) repairing the six he has at the moment. I'm sure Tore won't be out of work even if retired. He really knows how to keep himself occupied.

You certainly will hear him on 80 or 40 meters as he loves to work DX on those bands. I'm quite sure he won't say no to a little rag-chew as well. Give him a call when you hear him.

DX

Yes, there is something going on in Norway, but at this time we will not do anything more than quote to you the official bulletin from the 3Y Project 1984/85, administered by the LA-DX Group.

DXpedition to Bouvet Island. There may or may not be experienced radio amateurs among the crew of the Norwegian scientific expedition due to start from South America before the end of 1984. Bouvet will be the last stop after approximately 2 months en route, late in the season. A landing of short duration (1-3 days) may be expected. Amateur radio operation cannot be guaranteed.

Other transportation alternatives or combinations that would be suitable for a DXpedition are being explored by the 3Y-Project set up by the LA-DX Group in 1983, with Jorgen LA5UF as project manager, assisted by Einar LA1EE.

If suitable means of transportation are found, it will be the objective of this project to organize a DXpedition to Bouvet Island in January/February, 1985.

LA-DX Group would like to get in touch with persons, organizations, or companies that can contribute to a solution of the transportation problem—a ship with helicopter(s).

It would also be helpful to know in advance of contributions, if any, in funds or in kind that may be counted on for a DXpedition of this nature.

Write: 3Y-Project Manager Jorgen Hoel, Munkerud asen 12E, 1165 Oslo 11, Norway.

The reason for this press release is that several persons have been passing fake information about where to send contributions or donations, and to once and for all establish the facts. The LA-DX Group has been working on this project for more than a year, and it is recognized officially by the NRRL and other official departments in Norway.

If you should feel that you could perhaps be helpful to the project in any way, please do not hesitate to contact the above address or, if you prefer, me. I would be more than happy to pass the information over to the project manager, LA5UF.

We know that there are many who are needing Bouvet Island, and the efforts put into this project are absolutely serious. I will, of course, keep you informed without delay if anything new should occur.

POLAND

Jerzy Szymczak
78-200 Bialogard
Buczka 2/3
Poland

NEW CENTER OF SCOUT COMMUNICATION

Polish hams in scout uniforms enriched themselves with a new Communication Center in Losice, Miedzyrzecka 59. The Center consists of four buildings. The main building is in a reconditioned mill building. There are some schoolrooms, workshops, storerooms for measuring instruments and radio equipment, a sending/receiving center, and administration rooms. Two warehouses in Losice make it possible to store reserves.

The Center's school together with its library and radio station is in Nowosielec nearby. The carefully-repaired building rises on a little elevation. In summer, instruction camp tents can be raised all around the building. Equipment is available for 80 scouts. In the near future, two 30m masts of rotary antennas will be mounted close by. An emergency power supply makes operation of the radio stations independent. Amateur high-performance SW and USW radio stations can be installed.

What will the Center do in the future? Being well fitted out with modern measuring apparatus, the Center would provide telecommunication equipment for the Polish Scouts' Association (PSA) and prepare materials for training.

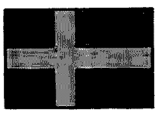
* * * * *

The presidium of PRAA (Polish Radio Amateurs Association) is preparing documents for the National Congress, delayed to the second half of 1984 because of the extending of licensing updating by State Radio Surveillance. At the last sitting of the presidium, new instructions of materials management and rules for development funds were accepted.

From January 14 to 17, 1984, the time-honored contest, "Warsaw Marathon," took place to commemorate the 39th anniversary of the Warsaw liberation. Three hundred radio amateurs all over Poland took part in the contest.

The main Inspectorate of State Radio Surveillance was informed of the resolution of WARC to render accessible to hams 10-, 18-, and 24-MHz bands, under permission of country administration. These bands, however, will not be accessible to Polish hams at present, State Radio Surveillance says. At first, we shall be able to work on 10 MHz.

In June, 1984, a symposium on electromagnetic compatibility takes place in Wroclaw. A special session for radio amateurs is foreseen within the framework of the symposium.



SWEDEN

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Sweden

FALU RADIOKLUBB ANNIVERSARY

The oldest still-active radio club in Sweden is located in the capital city of the district called Dalecarlia. The city Falun is primarily known for its copper mines. The Falun mine is older than the Kingdom of Sweden, but the copper mining company received its first known official charter from King Magnus Eriksson in 1347. During the 17th century, the Falun mine was the world's largest producer of copper. No mining is done there any longer, but visitors can tour the mine down to the 180-foot level.

Falu Radioklubb was founded on February 15, 1924, but had actually functioned as a radio-listener's club a year earlier. One of the members, Ove Mogensen, was already then experimenting with transmissions. The purpose of the club was to start regular broadcast transmissions and it was issued the call letters SMZK. This activity was financed mainly through private support but occasionally paid commercials were aired.

Sweden no longer has any privately run broadcast stations due to the state-owned monopoly broadcast radio. In 1950, Falu Radioklubb changed its activities into SWL and amateur radio. The club has twice hosted the annual ham convention for the national league, SSA. The first time was in 1960, the second time this year of the sixtieth anniversary for the club. In fact, Falu Radioklubb is one year older than SSA!

FALUN COPPER COIN AWARD

The club issues a beautiful award. It is a replica of the "one dollar copper coin" from King Karl XII's 18th century. In order to acquire this unusual award, you should contact radio amateurs within the county of Falun. All QSOs have to be made in the same mode, i.e., either CW or phone, not mixed. The minimum report accepted in the exchange is RST 338 on CW and RS 33 on Phone. For stations in Zones 14, 15, 16, and 20, each QSO gives one point. All others receive 5 points for a QSO on 80 meters, 3 points on 40 meters, and 2 points per QSO on 20, 15, and 10 meters. You can count the same station once per band, and the contacts have to be verified by QSL card. However, do not send any cards with the application, just a regular GCR listing. A total of ten (10) points is required for this award. Send the application and the GCR listing to Falu Radioklubb, PO Box 701, S-791 29 Falun, Sweden. The fee is US$15.00.

7SK4AO

During a two-month period up to the last day of the SSA Convention, April 15, 1984, Falu Radioklubb could use the special prefix 7SK. The Swedish Telecommunications Authority very reluctantly issues special prefixes, but when they do, the number 7 before the regular prefix is the way they do it. Swedish hams were denied the WCY prefix last year so they do not issue special suffixes either! Anyway, maybe you managed to contact 7SK9AC in Stockholm, June 8 through 10, which is the second Swedish special prefix station for this year. The occasion was the European DX Council in Stockholm.

SPECIAL PREFIX TO SK7AX DENIED

On May 18, 1984, the city of Jonkoping celebrated its 700th anniversary. The radio club SVARK (Sodra Vatterbygdens Amatorradioklubb) issues a penant award to commemorate this anniversary. The rules for the Match Town Award were published in *73* for December, 1983, on page 154. SVARK applied for a special prefix but was denied this as "the anniversary had nothing to do with amateur radio."

THAILAND

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Director-General of the Thai Post and Telegraph Department, Mahidol Chantrangkoon, recently told a group of prominent radio amateurs at an informal get-together that he intended to legalize HF for amateur radio "by the end of this year." Acknowledging that he had the authority to legalize private amateur radio, he admitted that it would take a few months to persuade more senior government officials of the importance of the amateur service.

Radio amateurs in Thailand have—more or less voluntarily—been off the air since December 31, 1982, with the exception of legal HF operations during major contests such as the Southeast Asia Net Contest, the All Asia DX Contest, and the *CQ* Worldwide contests last year. This period of inactivity followed a warning by the previous Director of the Post and Telegraph Department to operators that they should bring their HF equipment to be disabled and sealed by Thai PTT officials. The warning came in December, 1982, and followed what had been tacit acceptance of amateur radio by the authorities, with administrative matters and operating procedures overseen by the Radio Amateur Society of Thailand, albeit in an unofficial capacity.

At that time, the previous PTT director had recently established a "Volunteer Radio Operator Network" of Thais who, after sitting and passing an examination in radio theory, had been granted licenses to operate on six spot frequencies in the two-meter amateur radio band.

The then Director-General of the PTT said that he envisaged this as a forerunner to full, legal amateur radio, but he had added that it "would take a long time, perhaps many years, before HF could be authorized."

Only Thai citizens were, and are, at the time of writing, granted permission to operate on these frequencies.

Operators were assigned a three-letter number to be preceded by the letters VR—unfortunately, the amateur prefix for British overseas territories (now only Pitcairn Island—VR6) retains this prefix. While this operation has been the nearest thing to amateur radio in Thailand, it does not conform with the IARU designation or international practice. According to these regulations, all contacts must be made in Thai and contact established first on a fixed calling frequency.

Appointed Director-General of the PTT late last year, Mr. Mahidol reportedly said that he felt that amateur radio in Thailand should conform to international practice and that he intended to authorize HF this year. However, he admitted that there were still some hurdles to overcome and that the VR service would be retained for the time being in order to demonstrate how useful amateur radio could be for the community.

Recently, Mr. Mahidol praised the VR operators for assisting the authorities during emergencies and in helping police should they witness a crime. Nevertheless, he reportedly said that all qualified amateur-radio operators should follow international law and conventions.

He also told this group of concerned Thai hams that the authorities saw no problem in issuing authorization in response to applications made by the Radio Amateur Society of Thailand (RAST) to operate during contests in the meantime.

Hams in Thailand are optimistic in the light of this frank discussion during which Mr. Mahidol gave open and well-thought-out answers to many questions regarding amateur radio and its future in Thailand.

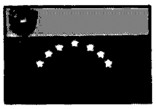
He openly criticized certain individuals who, he said, were using their influence with senior officials and were operating illegally on amateur frequencies. He said it was difficult for the PTT to enforce the law in some cases, but that he firmly wanted to see amateur radio legalized, for which

the Thai Radio Communication Act of 1955 provides.

The PTT Director-General reportedly said that foreigners who resided in Thailand and who held licenses issued in their home countries could certainly apply to operate on HF. This was taken to imply that such foreign residents, many of whom live and work in Thailand and who had been active previously, but are now not operating, would have the chance to be back on the air in the near future.

Such sanctioning of private HF operations would be a big step forward for Thailand which has opted to step firmly into the science and technological era with a Science and Technology Transfer accord signed in Washington during the Thai Prime Minister's visit there last April.

Hope to see you all on the air soon!



VENEZUELA

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CIRCUITO 1 (YV1)

The call area YV1, or Circuito YV1 as named here, is composed of the states of Zulia, Trujillo, and Falcon, all located in the northwest of Venezuela. Both Zulia and Falcon face the Caribbean Sea, and Trujillo, in the Andes, is facing Maracaibo lake toward the west and the plains at the east.

Alonso de Ojeda was the name of the Spaniard who discovered the now-named Lake Maracaibo, well known for the oil it produces. At that time, 1499, he didn't imagine the wealth in oil that lay under the waters he was sailing on.

Ojeda saw that the aborigines built their houses on piles over the water and that people went from house to house in canoes and on bridges and walkways. This sight reminded the Spaniard of the Italian city of Venice, and so he called it the Gulf of Venezuela (little Venice). After that, the whole territory was named Venezuela.

Lake Maracaibo is the largest lake in the Americas. It is around 155 kms long by 120 kms wide, and the deepest it goes is around 50 meters. During the 16th and 17th century, almost every buccaneer and pirate tried a raid of Maracaibo city in search of asphalt to caulk the ships. In those days, getting it out of the lake was not an easy task, as now it is.

Trujillo and Falcon

Trujillo, the capital city, was founded in 1557 by Diego Garcia de Paredes. The location of the city was changed so many times that it was once named the Portable City. The city is very small, long, and narrow, being only two blocks wide, and runs up through a mountain gorge.

The whole coast of Venezuela including the coast of Falcon was discovered in 1499 by Alonso de Ojeda. Falcon is a state of incredible contrasts. From beautiful beaches one next sees the wide coastal plain forming a small desert with light dunes, cactus, and sparse scrub thickets. Toward the south, the mountains are dressed with dense vegetation and lush forest.

Atop the mountains of Circuito YV1 are located a bunch of repeaters—9 in Zulia, 2 in Falcon, and 2 in Trujillo. Radio clubs are spread all around the main cities of those states.

Near Valencia city, in YV4-land, there is a repeater site on a mountain named El Cafe. The place is very easy to reach in a double-track vehicle. There is a site there for several dozen VHF and UHF repeaters, including many microwave links, police, fire, and civil defense two-way repeaters, plus many commerical ones.

One day, as I do regularly, I went up the mountain to inspect a couple of community repeater systems. While getting back from El Cafe, I thought about the possibility of linking amateurs throughout the whole country via 2-meter-FM repeaters. It already has been done by the telephone company, military stations, and commercial repeaters, but as far as amateur radio is concerned, repeaters have been installed without coordination.

Nevertheless, it is important to know that if you travel by car you may reach a repeater unless you are more than 200 km south and east of the Andes. And almost always you may reach more than one repeater by switching channels. At this time, two clubs have joined efforts and linked call areas 1, 2, 4, 5, and part of 3.

But, as I mentally went over the area, I went further. Why not link the Bolivarian countries? Bolivia, Colombia, Ecuador, Peru, and Venezuela all are Andean countries with the same interests, language, and history. During the trip to Caracas, I mentally looked at the map of South America trying to imagine the Andes crossing our countries. I was sure it could be done.

Back home, I took a look at a real map and confirmed that the Andes offer us the way to link the Bolivarian countries. To make things better, Panama, also a Bolivarian country, could also be linked. I was thinking about this for several days, and each new day I was much more convinced of the feasibility of this project.

During the Primer Seminario de Radioaficionados (First Radio Amateur Seminary), sponsored by Asociacion de Radioaficionados de Venezuela (ARV), it was very rewarding to hear Hebert Gonzalez YV1AHP offer to the ARV the possibility of linking one of the repeaters in Zulia state (installed by Amigos de los Dos Metros) with one of the repeaters sponsored by ARV. The offer was accepted and there is a project on the way. I asked the panel, during the meeting, about my idea—the Red Bolivariana de Repetidoras, as I thought it could be named. The panel accepted that technically it was feasible but had reservations about coordination among all five countries.

So far, I have talked with some OAs and some HKs and they thought also that it could be done.

At this moment, the project to link call areas 1 to 5 is a reality due to the effort of above-mentioned clubs. Now any amateur in Caracas is able to contact a friend in Maracaibo or a mobile in the Andeans. One-third of Venezuela is already linked via 2-meter-FM repeaters. The link is working very well—and even covers Valle Dupar in Colombia and the Antilles when propagation permits.

Here is my proposition: I wish that all amateurs in the Bolivarian countries interested in the project would drop me a line indicating how they could help. We need coordinators for each country, repeater sites, equipment, operating licenses from respective Ministries of Communications, etc. I wish to know what is already installed. We must know what is in operation on country borders and what could be used and what could not. We need criticisms, opinions, and facts (not just complaints!) and I will forward the information to both the Sociedad Amigos de los 2-Metros and Proyecto 79, since (to my knowledge) they are the most capable and enthusiastic. Besides, by the time this is published, they may have linked Venezuela from east to west along the north side of this country.

More than 150 years ago Bolivar crossed the Andes on horses and on foot without technology—just with valor and goodwill. This is not a legend, it is history. Don't tell me that we cannot cross the Andes by radio! According to my knowledge, the most difficult country to link is Peru because the Andes cross the country along its axis.

Anyhow, procedures can be developed later. At this time the most important thing is related to hardware. Maybe some links could be at 10 meters or whatever is available using FM. I think that if 10 meters is used, the mode should be FM, not SSB, for the sake of intelligibility.

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A CWC/I Publication

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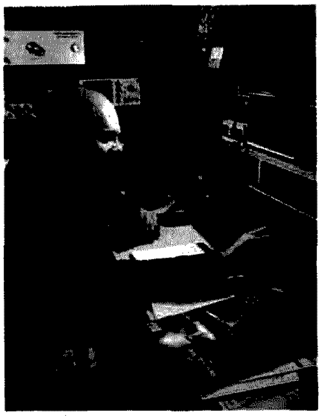
W2NSD/1 NEVER SAY DIE

editorial by Wayne Green



ALUMNI DINNER

A ham friend, Bill Ashby K2TKN/W8ETJ, who wrote articles for my *73* magazine, mentioned back in the early 60s that he was working for a firm making microcircuits. I think his firm was one of the first in the business. Now look where we are!

Here I am, twenty years later, sitting on a plane coming back from Washington, writing an editorial on a picocomputer. Well, perhaps things aren't all that different, really. Twenty-five years ago, when I started *73*, I used to carry a Hermes Rocket typewriter, which was not much bigger or heavier than my pico (briefcase) computer. The pico has word processing and an address file, so we've had some progress.

A lot of oceans have gone under my planes since then, and the world of microelectronics has gone berserk. 256K RAM chips indeed! Solid state was still just getting started twenty years ago, though I remember buying a couple tiny Sony BC/SW radios in Tokyo in 1959. They worked great, beating the dickens out of the little US-made broadcast transistor radios. That was before integrated circuits, so they had to use eentsy resistors and capacitors.

With the 25th anniversary of my starting *73* coming up in a few months, it seemed like as good a time as any to throw a small party for Wayne Green alumni. I keep running across people in the various electronics industries who at one time or another worked for me—and there have been a couple thousand. It seemed like it would be fun for us to get together and say hello again. If you know anyone who has ever worked for me, pass along the word, okay?

In 1960, amateur radio was growing at 11% per year—and had been for 17 years. There was an intense interest in new technologies, so I thought that a ham magazine devoted to home building and inventing would fly. I had just barely enough money to print and mail the first issue, which fortunately was in the black.

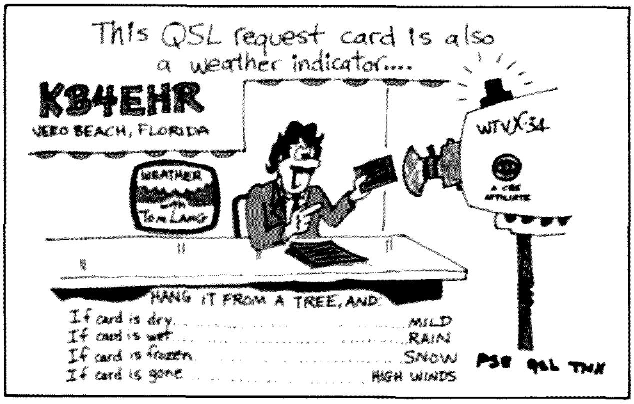
I started by doing everything: soliciting articles, editing them, proofreading the type, laying out the pages, selling the advertising, writing, printing, and mailing circulation letters, typing stencils for subscribers—everything. That's quite a learning experience. I didn't have money for going to the movies or eating much, so I made do with things like homemade oxtail soup, which was very cheap.

A couple years later, I moved the one-man staff (me) to New Hampshire and started recruiting used hams. The early ones were college dropouts who worked for the learning experience, room and board, and $20 a week. They helped with processing subscriptions, printing names on wrappers, editing articles, proofreading, bookkeeping, washing dishes, and so on. I taught them publishing, sold advertising, and cooked three meals a day for the tribe. We had up to eight living in and doing the work back around 1963. We had a ball!

When we had a chance, we piled into our VW wagon and headed out for a picnic, visiting New Hampshire's Polar Caves, Franconia Notch, The Flume, Cannon Mountain, Mount Washington, and so on. We climbed Washington, swam in The Foot Basin—it was fun.

Down through the years I've fed hundreds of people into the electronics and computer industries. One runs a very successful satellite-receiving business, another one of the top computer PR firms, and several are magazine editors. A call on the PA system at the West Coast Computer Faire for ex-Wayne Green

Continued on page 72



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to 73, 80 Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to 73. Entries not in envelopes cannot be accepted.

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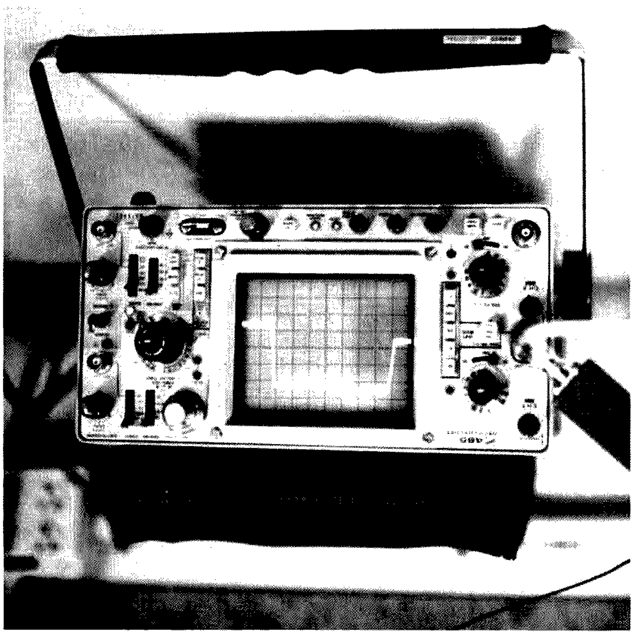
Find Fault with Your Coax

Is your cable really doing its job?
Find out with this elegant detective method.

Time Domain Reflectometry (TDR) is perhaps the most powerful method for wringing out a radio transmission line. Professional TDR instruments are expensive and therefore beyond the reach of amateurs. If you have access to an oscilloscope, however, you can build an *impromptu* TDR unit that will provide at least elementary capability.

TDR techniques can be used to locate faults on transmission lines, measure vswr, and determine the velocity factor of coaxial cable. The fault-finding capability is especially useful on systems containing very long transmission line, or, where the transmission line is hidden for much of its run.



The K4IPV home-brewed reflectometer.

Transmission Lines—Simplified and Revisited

Most amateurs have a rudimentary idea of the nature of a transmission line, especially as the term is used in radio-antenna contexts. On the naive level, we know that it is the cable which carries signals back and forth between the rig and the antenna. On a slightly more technical level, we find that the transmission line can be modeled as a complex circuit having both distributed inductance (L) and distributed capacitance (C). Fig. 1 shows an equivalent circuit. If dimension "A" in Fig. 1 is unit length, then L is the inductance per unit of length and C is the capacitance per unit of length. There is also a source impedance, R_S, which is the transmitter output impedance, and a load impedance, R_L, which is the antenna radiation resistance.

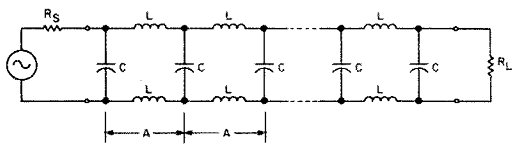


Fig. 1. Schematic representation of a transmission line.

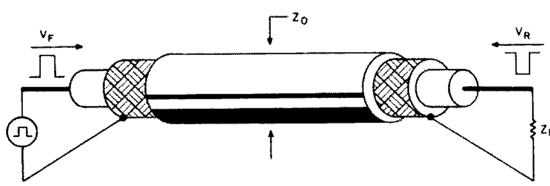


Fig. 2. Coax cable with surge impedance Z_0 and load impedance Z_L.

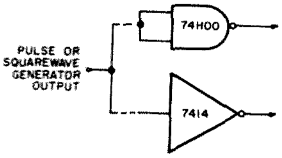


Fig. 3. Buffer to improve rise time of a signal.

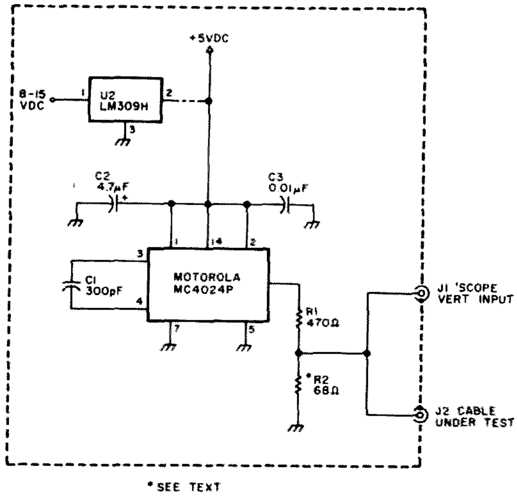


Fig. 4(a). Square-wave signal generator.

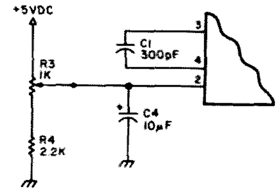


Fig. 4(b). Variable frequency modification.

Transmission lines have a property called either *surge impedance* or *characteristic impedance*, either of which is represented by the symbol Z_0. In the simplest definition, surge impedance is the square route of the ratio L to C: $Z_0=\sqrt{L/C}$.

Let's consider what happens on a transmission line; see Fig. 2. In this illustration, we have a length of coaxial cable with a surge impedance, Z_0, terminated with a load impedance, Z_L. At the input end of the transmission line is a pulse generator. So what normally happens?

We are told that the transmission line acts as if it were infinitely long when $Z_L=Z_0$. In that case, a pulse (V_F) applied to the input end will disappear into the coax and never return. In other words, the load will dissipate *all* of the pulse's energy when the load impedance (Z_L) matches the transmission line surge impedance (Z_0). This is why we put so much emphasis on a proper match between Z_L and Z_0, as indicated (hopefully) by a 1:1 vswr.

But what of the case where Z_L is not equal to Z_0? In that case, not all of the energy in the forward or incident pulse (V_F) is absorbed by the load. Some of the energy is reflected back down the line in the opposite direction. Pulse V_F in Fig. 2 is the forward pulse that is applied by the signal generator. When it hits the load end of the line, some of its energy is absorbed by Z_L and the remainder is reflected back towards the load in the form of pulse V_R. (Note that the *phase* of the V_R is reversed compared with V_F.)

Radio waves and pulses travel down a transmission line at a known velocity that is some fraction of the speed of light (c). The so-called *velocity factor* of a transmission line is that fraction. Thus, a velocity factor of 0.66 means that waves and pulses propagate in that line at 66% of the speed of light (i.e., 0.66c).

If the speed of propagation on a line is known or can be measured, and if we have a means of timing the interval between the application of the forward pulse and the return of the reflected pulse, then we can calculate the length of the line. If the line is either open or shorted, then the length computed is the distance from the input end and the fault. In a long system, such information can save a lot of hunt 'n' check work.

Signal Sources

There are two basic TDR techniques available to the amateur; one uses a real pulse and the other a square wave. Equipment needed for these techniques is rather simple, except for the 'scope.

The oscilloscope needs a bandwidth of 5 MHz or more (preferably more). In addition, it must have a horizontal sweep calibrated in units of time (e.g., µs/cm).

The signal source can be any pulse or square-wave generator, either commercial or home-brew. In researching this article, I used a Tektronix IM-500 series pulse generator, a Heath IF-18 square-wave generator, and several home-brew generators (discussed in text). It is highly desirable that the signal source have a fast rise time.

If your oscilloscope has a +GATE output, then you may already have a pulse generator. The +GATE outputs a short-duration pulse every time the sweep is triggered. In the auto-trigger (i.e., free run) mode, the sweep is constantly retriggered regardless of whether or not a signal is present in the vertical channel. Thus, we will see a constant pulse train at the +GATE output during auto-trigger operation.

If you plan to use a square-wave generator as the signal source, then it may be advisable to improve the rise time of the signal. Fig. 3 shows two buffers that can be used. The 74H00 is a high-speed version of the 7400 two-input NAND gate. This device is shown connected as an inverter (i.e., both inputs tied together). The 7400 is recommended for TTL-compatible outputs.

The 7414 used in Fig. 3 is a Schmitt trigger. As such, it will produce a fast rise-time output pulse. Like all TTL devices, there are limits to the allowable input-voltage swings. Note that the Schmitt trigger can be used to make square waves out of sine waves. The Schmitt output is binary, i.e., only two states are allowed, HIGH and LOW. The output will snap HIGH when the input passes a certain threshold voltage in a positive-going direction and will drop LOW only when the signal crosses another threshold in the negative-going direction.

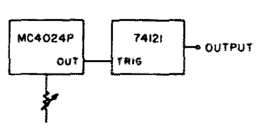


Fig. 5(a). Pulse-generator circuit (block diagram).

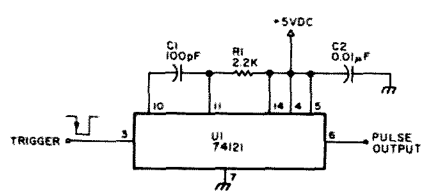


Fig. 5(b). Pulse-generator schematic.

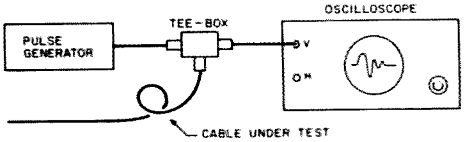


Fig. 6(a). Test setup.

Fig. 4(a) shows a homebrew square-wave signal generator based on the Motorola MC4024P voltage-controlled oscillator (vco) chip. *Note*: this is not the CMOS 4024 device.

The MC4024P contains two vco's, but this project uses only one. The frequency is controlled by capacitor C1 and is set to approximately the range needed for our application. In some cases we will want to vary the frequency, so we can use the circuit modification of Fig. 4(b). Potentiometer R3 changes the voltage applied to the vco-control input (pin 2). A 3:1 frequency ratio is possible. One use for this capability is optimization of one of the TDR techniques given below.

The output from the MC4024P device is a TTL-compatible square wave. For TDR, however, we can use almost any level within the ability of the 'scope, but the source must have an output impedance that is matched to the transmission line. Impedance matching is the function of R2 in Fig. 4(a). If only one style of coax is being tested, then set R2 equal to its Z_0 (e.g., 50 Ohms, 75 Ohms, etc.); the value of 68 Ohms allows testing in 50- *and* 75-Ohm systems with only a small effect on the system.

The photo shows the version that I built. In this case only one BNC jack is used, and an external BNC "tee" separates the signals to the oscilloscope and the cable under test. Note that the entire system, including the Pomona box, represents only a $15 accessory to a standard oscilloscope.

A pulse-generator circuit is shown in Figs. 5(a) and 5(b). Here we see a monostable multivibrator (one-shot) driven by a square-wave source such as the one in Figs. 4(a) and 4(b). The detailed circuit for the one-shot stage is given in Fig. 5(b).

A typical test setup is shown in Fig. 6(a). The interconnections between instruments is accomplished by a special tee-box—see Fig. 6(b). The circuitry is housed in a Pomona box fitted with three BNC or (if older test equipment is used) SO-239 UHF connectors. When building the tee-box, keep leads as short as possible; use "good VHF layout practices." Note that the tee-box is not needed if you build your own pulse/square-wave signal source that incorporates similar elements.

TDR Methods

There are two methods by which we can use TDR on simple systems. If a pulse-train signal source is used, we will get indications such as Fig. 7. The forward pulse, as applied by the signal source, will have a higher amplitude and sharper features than the reflected pulse. Coaxial code normally attenuates signal, so one would expect the amplitude to decrease. The waveshape also will change since this attenuation is different for different frequencies.

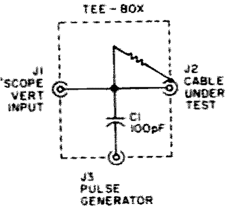


Fig. 6(b). Tee-box detail.

Notice that the reflected wave is different in (a) and (b) in Fig. 7. In (a) we see the situation existing when the transmission line is unterminated, i.e., open-circuited. Here the reflected pulse has the same polarity as the forward pulse. If there is a break in the coax line, then we will see this waveform. The situation for a terminated or shorted line is shown in (b); here the reflected wave has a reverse polarity.

The length of the line can be found from the time T required for the reflected pulse to return to the point of origin. The following factors affect T: length of the line, velocity factor of the line, and constant representing the speed of light. Our basic equation is:

$$L = 983.5VT/2$$

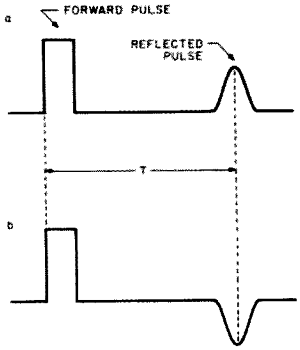


Fig. 7. TDR with a pulse-train signal source.

where L is the line length in feet, V is the velocity factor (0–1), T is the round-trip time in microseconds, as measured on the oscilloscope, 983.5 is the speed of light in feet per microseconds (ft/μs), and 2 represents the fact that T is a round-trip time.

We can rearrange the basic equation to also find T or V, as needed:

$$V = 2L/983.5T$$
$$T = 2L/983.5V$$

Let's work an example of each. Let's say we have a long piece of 75-Ohm coaxial cable used as a data line between the computer and a CRT video terminal. Your boss knows you catch bullets in your teeth and dabble in ham radio. *You*, therefore, are the resident expert and have to find out where the signal went. Being smart enough to subscribe to this magazine, you remember this article and pull it out. You obtain a pulse waveform similar to (b) in Fig. 7 and measure T as 0.63 microseconds. How far down the line is the short? First, we must determine the velocity factor. Since most TV-type coax is foam, we

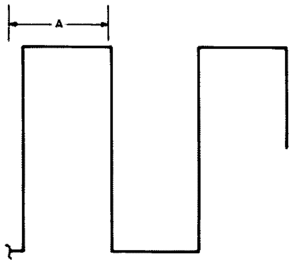


Fig. 8. Adjust square wave to match "A."

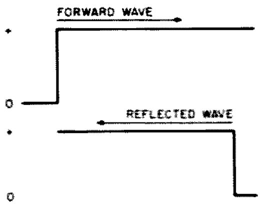


Fig. 9(a). The adjusted waveform.

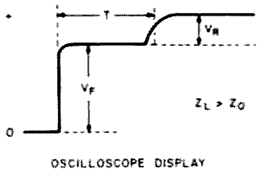


Fig. 9(b). Sum of the forward and reverse voltages.

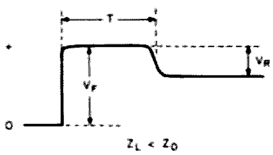


Fig. 9(c). Load impedance less than surge impedance.

can assume $V=0.8$. Therefore:

$$L=983.5VT/2$$
$$L=(983.5)(0.8)(0.63)/2$$
$$L=495.7/2=248 \text{ feet}$$

Tracing the line on the building plans, you find the area where the short should be found. Going to that area, you find a carpenter at work subdividing a room—and find the nail he drove through your coax! You hold off busting his chops when you notice the hammer in his hand.

You can use the same equation to find the length of coax needed to accomplish a specified delay. Coax delay lines are used often and are a lot cheaper than lumped-constant delay lines.

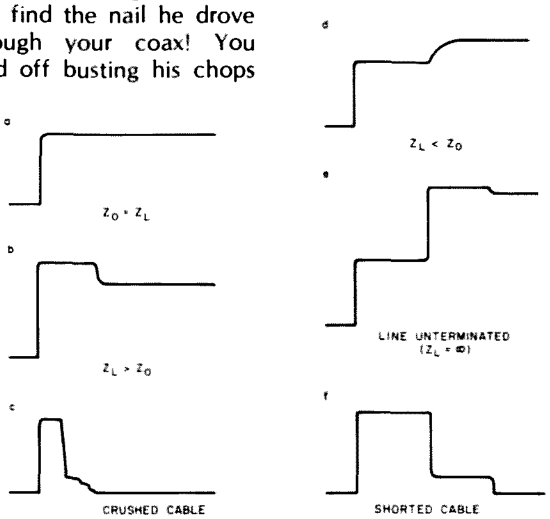


Fig. 10. A variety of traces.

It is necessary to know the actual velocity factor (V) of a piece of coax. If you are trying to make a quarter- or half-wavelength stub, then the velocity factor must be known. For noncritical applications, we can accept the common wisdom factors of 0.66 for regular cable, 0.7 for Teflon® and 0.8 for foam. But *actual* velocity factors often differ from these values, so they must be measured.

Make the measurement of T using about 50 feet of cable. The precise length must be known, and the load end should either be left unterminated or terminated in a severe mismatched impedance. This latter stipulation is needed to enhance the reflected pulse. If L and T are known, then V can be computed. If you make enough measurements on coax, you will find that published velocity factors are quite nominal and that the range of V for supposedly identical samples of cable is quite large. In fact, you may well come to doubt much of the "standard wisdom" published about transmission lines popular in amateur radio.

The alternate method used for amateur TDR uses a square wave rather than a pulse. Adjust the square-wave frequency and the oscilloscope timebase to display the top portion of the square wave as shown by dimension "A" in Fig. 8. For a perfectly symmetrical square wave, the period will be approximately 2A, so the frequency will be 1/2A.

In Fig. 9(a), the upper waveform represents the applied square wave as viewed on an oscilloscope adjusted per above instructions. The lower trace is the reflected wave.

The display on the oscilloscope will be the *sum* of forward (V_F) and reverse (V_R) voltages, such as Fig. 9(b). In the case where the load impedance is equal to the coax surge impedance (i.e, $Z_L=Z_0$), the trace will be similar to the upper trace in (a). The trace in (b) represents the case where the load impedance is greater than the surge impedance ($Z_L > Z_0$), while 9(c) is that obtained for Z_L less than Z_0 (i.e., $Z_L < Z_0$).

These traces not only tell us the direction of mismatch but also the approximate magnitude (in the form of a vswr). Using the designations of Figs. 9, we can compute the approximate vswr from:

$$\text{vswr} = V_F+V_R/V_F-V_R$$

The vswr measurement thus obtained is only approximate because transmission line attenuation reduces the reflected power returning to the transmitter end. This method, like all other methods, produces valid results only when the measurement is corrected for normal attenuation effects and the line is a multiple of half wavelength.

Fig. 10 shows the results of square-wave TDR for various situations. Fig. 10(a) shows the situation where $Z_L=Z_0$. If the system is perfect (rare!), then the upper horizontal line in (a) will be perfectly flat. If there are glitches in that portion, then it may indicate anomalies on the line. I have seen both minor crushes or bends and in-line connectors splicing sections of line cause anomalies in an otherwise perfect trace. For connectors, the glitch may be slight (especially if BNC connectors are used), but it *will* be present.

The traces shown in Fig. 10 demonstrate the wide degree of change of the trace caused by line problems. Although Time Domain Reflectometers are complex instruments compared with our simple system, our system is capable of giving us a great deal of data about transmission lines that would otherwise be difficult to obtain.■

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The Aussie Parasol Beam

What has twelve corners, three bands, and uses 140 feet of wire? Hint: It's not a quad.

The Australian ham with Novice-license privileges is limited to certain frequencies and very low antenna power—somewhere in the vicinity of 20 Watts PEP. Nevertheless, many of these Novices (not necessarily beginners in electronics) produce outstanding signals all over the globe on the 10- and 15-meter bands. Some of these stations, such as VK7KDR (formerly VK7NDR), VK7NRD, VK3VGW, and others that I have worked over 100 times, have spent many hours hand-honing their antenna systems close to perfection.

During the years 1978 through 1982, when I was on the air every day, there were many VK Novice stations that *consistently* laid down S9+ signals at W6TYH. My curiosity being aroused, I contacted most of these hams and found that they were using the VK2ABQ "parasol" beam antenna described by Fred VK2ABQ in the October, 1973, issue of *Electronics Australia*.

I wish to express my gratitude to the many VK hams who mailed me photocopies of the original article and others that showed more recent modifications of this unusual antenna system.

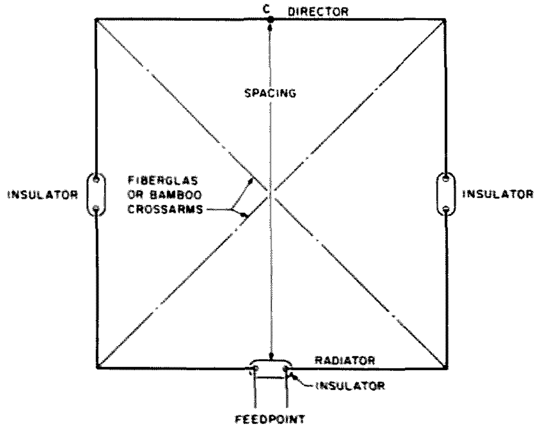


Fig. 1. Australian parasol beam antenna. Construction is similar to one frame of a cubical quad, but plane of loop is parallel to surface of the earth. Array is horizontally polarized.

One of the features of the parasol array that first caught my attention was its small, compact size. I immediately had visions of a 40-meter beam using a parasol-type loop. It is also suitable for the ham who wants a triband antenna system but is cramped for space. Because it is very light, when constructed with ordinary copper-wire conductors and bamboo or fiberglass spreaders, it can be rotated with a heavy-duty TV antenna rotator.

To satisfy my curiosity, I built and tested a dual-band parasol array with loops for the 10- and 15-meter bands only. Although the installation was not permanent, the following data should be of interest to all hams who desire a low-cost, simple, and low-weight antenna system for the three highest HF bands.

Antenna Design

As shown in Fig. 1, the parasol antenna consists basically of two wire conductor elements, each of which has its ends bent inward at right angles to the center section. Since most of the radiated field from an antenna element emanates from the center portion, the radiation efficiency is not noticeably poorer than that of a given element that used inductive traps or other shortening devices. As shown here, the parasol array is a modified 2-element yagi, using a driven element and a parasitic director.

The Australian versions of the array are fed directly at the center(s) of the driven element(s) with 72-Ohm coaxial cable. Although no specific swr figures were included in the photocopy material received from Fred VK2PHQ, I have been informed that the line swr is not greater than 2.5:1 when the three driven-element feedpoints are connected in parallel and fed from a single 72-Ohm line.

Frequency(MHz)	A	B	C	D	E	F
7.15	46' 7"	8' 2"	9' 9"	46' 7"	25'	16' 9"
14.3	23' 5"	4' 1"	4' 10"	23' 5"	12' 6"	8' 4"
21.3	15' 8"	2' 9"	3' 3"	15' 8"	8' 5"	5' 8"
28.6	11' 8"	2'	2' 5"	11' 8"	6' 3"	4' 2"

Table 1. Approximate dimensions of elements and spacing for 40-, 20-, 15-, and 10-meter parasol beam antennas.

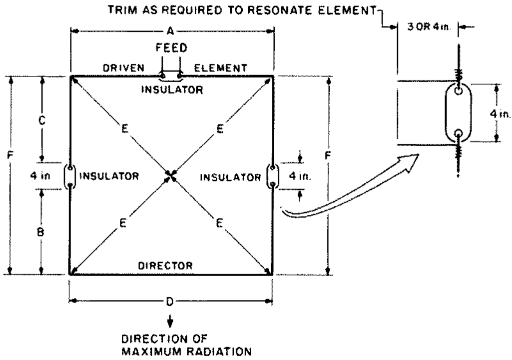


Fig. 2. General arrangement of parasol beam antenna.

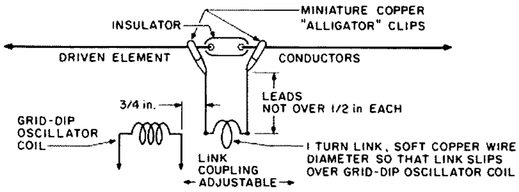


Fig. 3. How the grid-dip oscillator is coupled to the feedpoint of the driven element (see text).

In the W6TYH experimental version, the driven elements were fed by separate gamma-match arrangements, the coaxial line being switched from one to the other by a stepping relay. It should be possible to "match" the 72-Ohm (or 52-Ohm) coaxial line to the three feedpoints at a practical usable swr value by attaching a suitable coaxial line transformer to each feedpoint and connecting them in parallel at the end of the main transmission line.

The length of the folded, or bent, end sections will depend on the spacing between the driven and parasitic elements. In the W6TYH experimental version, the spacing (free space) between the centers of the driven and parasitic elements was made 0.11 wavelengths to keep the overall size as small as possible. Table 1 gives the dimensions of the parasol array for one-, two-, or three-band operation. The element lengths, particularly in the three-band arrangement, are approximate and should be "dipped" and trimmed to resonance as described later.

The approximate dimensions A, B, C, D, and E of Fig. 2 can be calculated by the following formulas. Assuming insulators I1 and I2 are 4 inches long, with F being the frequency in MHz and A to E dimensions are in feet, A = 335/F, B = 58.3/F, C = 69.7/F, D = 335/F, and E = 178.75/F.

It must be emphasized that the above dimensions are approximate but will be close to the actual operating values. The ends of the element conductors can be made about 3 or 4 inches longer than the calculated values, as shown at B in Fig. 2, and then trimmed to resonate the element at its proper frequency. In most cases, the director element will function satisfactorily when cut to the calculated value or about 5 percent shorter than the driven-element length.

Practical Construction

To start, you will need one spider or X mount, such as those used in the construction of the cubical quad antenna. You also will need four crossarm (spreader) sections, as shown. Each crossarm should be at least 14 feet long if a triband 20-15-10-meter array is to be constructed. The crossarm drilling data can be found as dimension E in Table 1. All of the wire elements should be strung on the frame before attempting any resonance adjustments.

With the array at least 8 or 10 feet above the ground, start with the 10-meter driven element and resonate it as described in the next section. Next, resonate the 15-meter driven element and recheck the resonant frequency of the 10-meter driven element. Third, resonate the 20-meter driven element and recheck the resonant frequencies of both the 15- and 10-meter elements. In the prototype array at W6TYH, the interaction between the three driven elements was negligible as far as the dip meter indication was concerned. However, when each driven element was being adjusted for lowest reflected power at its feedpoint, the swr reading changed when the matching adjustments of the other driven elements were moved.

It is likely that the greatest interaction will take place when all three feedpoints are connected in parallel and fed by a single coaxial transmission line. If the line swr is not higher than 2.5:1 on the element with the highest swr, usually 20 meters, the performance of the array will not have deteriorated to any great extent and an antenna tuner can be used at the transmitter end to present a 50-Ohm-resistance load to the transmitter output terminal.

Resonance Adjustments

As in any other parasitic array, the parasol antenna will give optimum performance only if the driven and parasitic elements are resonant at their proper frequencies. The length dimensions given for the parasitic director elements are about 5 percent shorter than those of the driven element. In the prototype array, the parasitic directors were calculated and cut according to the formula. The directors performed satisfactorily without further adjustment. The driven-element lengths required adjustment, however, as outlined below.

The preliminary driven-element adjustments are most easily made with a grid-dip oscillator and a calibrated receiver. First, make a 1- or 2-turn link coil from no. 14 soft-copper wire and with a diameter small enough to fit snugly over the grid-dip oscillator coil. As shown in Fig. 3, the link-coil ends are fitted with small copper alligator clips. Connect the alligator clips to the center ends of the driven-element conductors, as shown. Slip the

Parts List

140 feet, no. 12 copper wire, plastic covered household type	@ 10¢ per ft.	$14.00
4 bamboo spreaders	@ 50¢ ea.	2.00
1 marine plywood, 3/8" × 18" × 18"	@ $2.00	2.00
4 carriage bolts, 4-1/2" × 1/4"	@ 30¢ ea.	1.20
4 carriage bolts, 2-1/2" × 1/4"	@ 25¢ ea.	1.00
4 U-bolts, 1-1/4"	@ 75¢ ea.	3.00
Miscellaneous (alligator clips, etc.)		2.00
		$25.20

Note: 52- or 72-Ohm transmission line and insulators not included in above total.

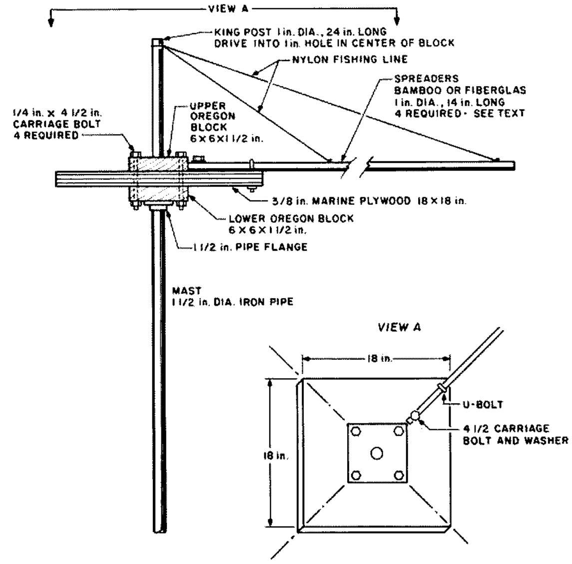


Fig. 4. Array assembly, parasol antenna.

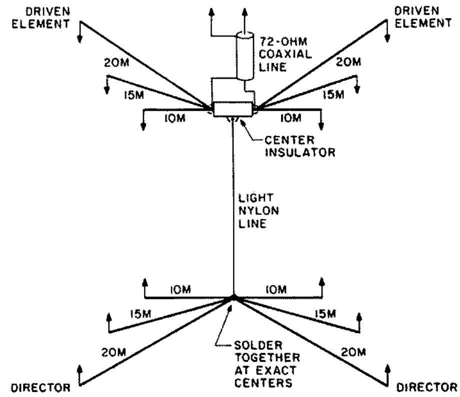


Fig. 5. Original Australian feed arrangement.

link coil over the grid-dip coil form, and rotate the grid-dip oscillator dial until a deep null or "dip" is indicated.

With the calibrated receiver, check the grid-dip oscillator at the point where the null occurs. During this first check, the resonant frequency of the driven element is almost certain to be very close to, or outside, the lower frequency limits of the amateur band. Clip off half an inch or so of the excess wire at the support insulators and repeat the process. Be sure that you check the grip-dip oscillator frequency *with the calibrated receiver* each time that a dip is indicated. *Do not* depend on the calibrations of the grid-dip oscillator dial as the oscillator will be pulled off calibration by absorption of the rf energy by the driven element at its point of resonance. This pulling effect can be reduced by reducing the coupling between the grid-dip oscillator and the link coil to the point where only a very small null is indicated.

Continue to trim each end of the driven element and check the grid-dip oscillator frequency at the null until the element is resonant at a frequency about 50 kHz lower than the desired operating frequency. The driven-element resonant frequency can then be "worked in," or "fine tuned," to exact resonance at the operating frequency during the matching adjustments.

During the adjustment of the driven element for resonance, it is possible that the grid-dip oscillator may indicate two nulls—one deeper than the other. The major null will indicate the frequency at which the driven element is resonant. The minor null will be somewhat higher in frequency and will be the resonant frequency of the director. With very close coupling between the pickup loop and the grid-dip oscillator coil, the minor null should be pronounced. When the coupling between the link coil and the oscillator coil is reduced, the minor null may not be apparent. The minor null should occur at a frequency about 5 percent higher than that of the driven element.

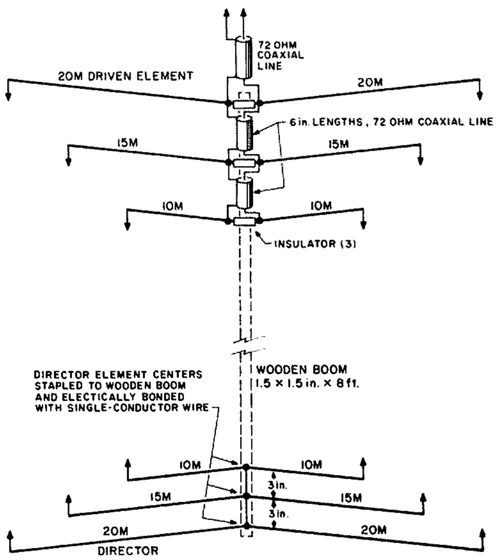


Fig. 6. Modified version of Australian parasol antenna (said to improve front-to-back ratio).

Mounting the Array

In the original Aussie version of the array, the spreaders were mounted on an 18" × 18" × 3/8" piece of "bondwood" (plywood) as shown in Fig. 4. If the plywood mount is used, it should be good quality *marine plywood*. The center of the board was reinforced by a pair of 6" × 6" × 1-1/2" "Oregon" blocks. The upper plate has a 1-inch hole at the center for the 1-inch-diameter dowel kingpost. The kingpost is about 24 inches high and is sanded to fit tightly when driven into the center hole of the upper block. In the VK version, the spreaders were made from 1-inch hardwood dowels. Most American hams will prefer bamboo or fiberglass spreaders. Each spreader is supported at two points, as shown, by heavy-duty nylon fishing line; hence the name, "parasol array."

Feed System

The original Australian feed arrangement for the three driven elements is shown in Fig. 5. Here, the three driven elements use a common center insulator with the three feedpoints connected in parallel and fed with a single coaxial transmission line. A nylon tie cord is connected between the driven-element center insulator and the center point on the parasitic director (or reflector, as the case may be) and is drawn taut. The center

points of the three directors (reflectors) are electrically bonded together.

Another VK arrangement is shown in Fig. 6. Here, a light wooden boom, 1-1/2" × 1-1/2" × 96", is used to support the driven-element center insulators. The three feedpoints are connected together with short lengths of 72-Ohm coaxial cable. The center points of the director (reflector) are attached to the wooden boom, as shown, and connected together electrically with a single copper conductor.

Antenna Performance

The W6TYH parasol array was constructed to satisfy my own curiosity, more or less. Although the antenna was a jerry-built affair mechanically and was suspended by a rope and pulley attached to an overhanging tree limb, it was electrically correct. On the 15- and 10-meter bands its performance was compared with that of a "standard" 2-element yagi similar to the one I described in "Rotary Beam for 10 or 15: the LB-2" (*73* for May, 1980), and in most cases there was little difference in the strength of the distant signal. The experimental model appeared to have about 5 dB forward gain and about 15 dB front-to-back ratio—about the same as that of the 2-element yagi used for comparison. The Australian hams rate this antenna at 5 dB forward gain, 18 dB front-to-back ratio, and 37 dB side rejection when used on the 15-meter band.

At any rate, the parasol antenna is probably the least expensive tribander. It should be possible to build it for not over twenty to thirty dollars. It can be rotated easily with a TV antenna rotator. ■

✓ See List of Advertisers on page 98

The Incredible Broadband Bowtie

Truly designed for solid-state finals, this 75m antenna features 50 Ohms at the feed—and less than 1.5:1 swr across the band.

Jim Burtoft KC3HW
RD #2, Box 131
Washington PA 15301

"Yeah, I've got a transistorized transceiver . . ."

"Do I like it? Sure, I like it a lot . . ."

"What do I think of the solid-state finals? Well, they are not as great as they sound. The finals are really sensitive to swr. I ended up buying an antenna tuner just to get the thing to load up."

If you're the owner of an all-transistor rig, you've probably had a QSO like the above. While these rigs are nice, they do have their own set of problems. Chief among the problems is their best known feature—the solid-state final amp.

Transistor rigs differ substantially from their tube-final cousins. Tube finals use an impedance-matching (pi) network to match the tube's impedance to the antenna's impedance. Transistors do things another way. Power from the broadbanded final transistor is fed through a bandpass filter into a 50-Ohm load.

Swr meter showing the swr (the tuner was bypassed).

This new system means that theoretically you can set the tuning dial to any frequency and generate a signal with no further adjustment to the transmitter. This possibility intrigued me because I enjoy rag-chewing on 75-meter phone and I operate a transistorized rig. However, a little experimenting showed me that it wasn't going to be as easy as it sounded. There's a catch.

While the transistor finals are broadbanded, they require that the load they feed be 50 Ohms or very close to it. Unfortunately, a dipole antenna is not broadbanded. Keeping the swr low as you tune across the band—that's the catch.

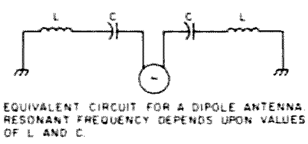


Fig. 1.

According to the theory books, a dipole should be able to cover a band equal to three percent of its design frequency. That's 100 kHz on 75 meters without exceeding a 2:1 swr. That's not much of a spread.

I decided that what I needed was a broadbanded dipole. The design requirements were:

1. Uses no exotic or expensive material.
2. Easy to construct.
3. Achieves a 1.5:1 swr or less over the 75-meter phone band.

Design requirement number one eliminated double bazookas and folded dipoles. They require expensive coax and ladder line or an impedance-matching network. I wanted to keep it cheap and easy.

As I searched, my mind wandered back to a short blurb in William Orr's *Radio*

Handbook. In his description of a tuned doublet antenna, he mentioned that the antenna could be made more broadbanded by fanning the ends of the antenna. Could the answer to my search be a simple adaptation of this idea? I decided to find out.

To start, I cut enough wire for two dipoles. The two dipoles were tied together at the center insulator while the legs were fanned one foot apart. Swr measurements indicated that I was heading in the right direction although there were a couple of problems.

The first problem was that the new combined dipole was too long. The old dipole formula just didn't work in this situation. This change was an unexpected confirmation of a lot of the antenna theory I had learned.

Remember that an antenna is equivalent to a series-resonant circuit. In fact, we could substitute a series-LC circuit for an antenna as in Fig. 1. The resonant frequency depends upon the values of L and C. If either L or C changes, the resonant frequency shifts.

Now let's go back to a real antenna. The LC relationship still applies. By spreading the ends, we have increased the antenna's capacitance. This, of course, shifts its resonant frequency. The only way to bring the frequency back is to compensate by changing the inductance, too.

Inductance is changed by shortening the antenna. In this case, the antenna had to be shortened a total of ten feet to bring the frequency back. It's the reduction of inductance, incidentally, which increases an antenna's broadbandedness.

The second problem was mechanical—how to keep the antenna in its proper position. On my first attempt, I used strips of wood to spread the antenna ends apart by about one foot, with a halyard attached at the center. This worked, but when hoisted into the air, the ends wanted to windmill, twisting the wires together and reducing capacitance.

No sweat. I just hung a brick to the bottom of each spreader. That solved that problem but created another. The whole thing took on a Rube Goldberg appearance; it was a visual embarrassment. Besides, there was the practical problem of having these two bricks suspended forty feet in the air on the ends of some rope. Needless to say, the XYL was quick to point out these problems, too.

Eventually both problems were resolved with the development of the "Broadband Bowtie Dipole" seen in Fig. 2. One look at the drawing should explain how the antenna got its name.

After numerous cuts and tries, I found that one-hundred-ten feet seemed to make the antenna resonant about the middle of the 75-meter phone band. Experiments also showed that fanning the ends more than three feet offered little or no advantage. With the ends fanned three feet, my swr was less than 1.5:1 on the edges of the phone band (see Fig. 3). Now my transistor finals perk happily along with no need to tune.

Length of the transmission line is also important. To have your transistor transceiver see the same impedance as the antenna offers, the transmission line must be some multiple of one half wave. For solid dielectric RG-58, this is a multiple of eighty-three feet.

Mounting problems were solved with the double-halyard system also shown in Fig. 2. Rope spreaders replace the original wood spreaders. Be careful not to put too much tension on the lower halyard or the whole system will be dragged closer to the ground.

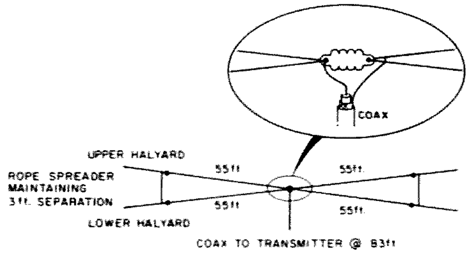


Fig. 2.

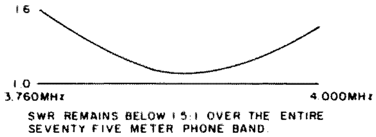


Fig. 3.

Incidentally, those interested in antennas might like to know that all antennas at station KC3HW are made from electric-fence wire. This 18-gauge steel wire comes on quarter-mile spools and is long-lasting. It's available through farm-supply stores and Sears for about ten dollars a roll.

More avenues of experimenting are open to you, the reader. How about a higher band? While I've not attempted to try the Bowtie on forty meters, it should have a flatter swr than on seventy-five.

Best of luck, and enjoy your newfound freedom. ■

✓ See List of Advertisers on page 98

Joseph J. Carr K4IPV
5440 So. 8th Road
Arlington VA 22204

℞ for Ailing Antennas

Maximize your system's performance with this easy-to-construct noise bridge. It's just what the doctor ordered.

The *antenna noise bridge* is an instrument which most amateur-radio enthusiasts have seen advertised but only a few know how to use. Several different models are offered by Palomar, Omega-T, and MFJ (see photos). When used with a receiver (preferably a general-coverage shortwave receiver), the noise bridge makes it easy to "wring out" antennas, transmission lines, and other tuned circuits.

The heart of any bridge, perhaps, is the signal source. In the noise bridge, the signal source is a noise generator such as shown in Fig. 1. The actual noise source is the zener diode connected to the base of transistor Q1. A zener diode operating in the avalanche mode produces large amounts of semi-white noise. If you connect it to an audio-amplifier input, then the output is perceived as hiss. Some people call this circuit a Gaussian noise source, but that designation is a little off the mark. True Gaussian noise contains all phases and amplitudes of all frequencies. The noise produced by the circuit in Fig. 1 is bandwidth limited to less than 300 MHz, or so. If Q1 through Q3 are selected with care, this generator produces results throughout the HF spectrum and in the VHF spectrum at least to 2 meters.

The stages following the noise-generating diode form a wideband amplifier. If the transistors are selected for UHF frequency characteristics, then the frequency response will be well into the VHF range. Good selections from the replacement lines are ECG-107 and ECG-108 or their equivalents.

Noise bridge from Omega-T.

Fig. 2 shows the actual bridge circuit. The block marked "noise-generator circuit" is a circuit such as in Fig. 1.

The heart of the noise bridge is transformer T1. There are three windings on the toroidal core of T1, and these windings are trifilar-wound. A toroidal core capable of 1- through 150-MHz operation, about 3/4 to 1 inch in diameter, should be sufficient. The wire is #28, either enameled or with the sort of synthetic material that covers wire used in wire-wrap systems. Ten to 15 turns are appropriate.

Conceptually, this bridge is similar to the simple Wheatstone bridge. Recall that that bridge contains four arms (each a resistor) formed into a diamond-shaped circuit. Excitation is applied between two of the resistor junctions while output signal is taken from the other junctions. In the noise bridge, coils L1 and L2 form two of the arms, the antenna impedance forms the third arm, and impedance R1/C2 forms the fourth arm. Excitation is through coil L3. Since L1/L2 are trifilar-wound, these two coils form identical impedances. Thus, the bridge will be in balance when the antenna impedance matches R1/C2.

Capacitor C1 has a value half that of C2. Thus, C2 will have to be exactly in the middle of its range to balance (i.e., null) the circuit. The purpose of this scheme

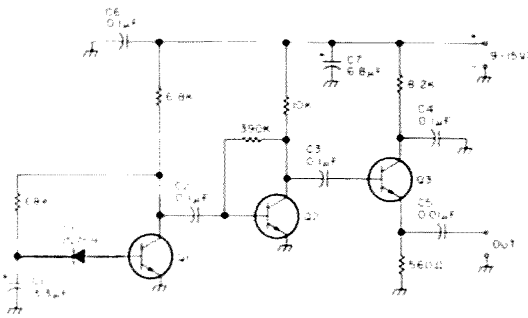
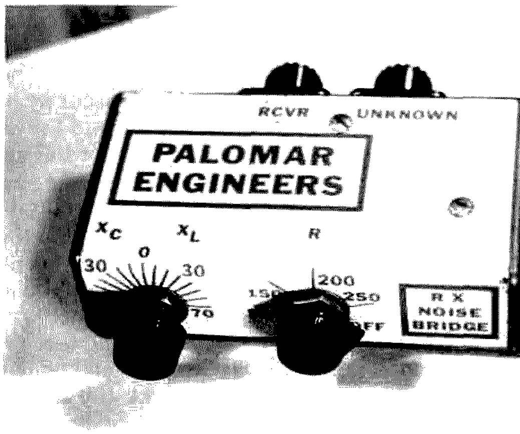


Fig. 1. Noise generator as the signal source.



Palomar Engineers' noise bridge.

MFJ rf noise bridge.

is to allow measurement of inductive reactance components of antenna impedance as well as capacitive. Exactly at resonance, the antenna impedance reactances are equal ($X_L = X_C$), so they cancel each other. In that case, the value of C2 equals C1. If the antenna is capacitive (X_C greater than X_L), then the null is found on C2 at a capacitance less than C1. If, on the other hand, the antenna is inductive (X_C less than X_L), then the null will be found when C2 is greater than C1.

Null occurs when the impedance of R1/C2 is equal to the antenna impedance (taking into consideration C1). This null is indicated by a sudden decrease in the noise level coming from the receiver (or by a dip on the receiver S-meter). This response is shown in Fig. 3. There is usually a lot of interaction between R1 and C2, so these controls must be adjusted several times to find true null.

The null indicator is a receiver. The best type of receiver is a general-coverage shortwave receiver with an envelope (i.e., AM) detector and, preferably, an S-meter. Ham-band-only receivers require the null be inside the ham bands (often *not* the case!). I have found it difficult to use the bridge with SSB/CW modes. Tune very slowly while searching for the null. Perhaps the most common mistake made when using a noise bridge is tuning the receiver too fast. The null tends to be sharp, and is easily missed if tuning rate is high.

Finding Antenna Length

The arithmetic equations which we use to find antenna lengths are "ball park" only, except in someplace called "free space." The real physical length will be longer or shorter than the calculated length. Part of the job in setting up an antenna is cutting (or lengthening) to size. In the usual scenario, one takes a vswr bridge and measures the swr at several points within the band in order to find where the minima is located. From that information we can tell whether to lengthen or shorten the antenna.

The noise bridge gives us another method. We connect the general-coverage receiver via a short length of coax to the RCVR port of the noise bridge, and the antenna coax to the ANTENNA port of the noise bridge. Set the X control on the bridge to mid-range (i.e., C2 at half-scale) and the R control to some value between 5 and 20 Ohms (will be readjusted later). The receiver is tuned to the antenna design frequency. The procedure is as follows:

1. Vary X for a null; this null will be broad, so listen carefully and tune slowly.

2. Observe whether the X nulls are on the X_L or X_C side of zero. If the null is on the X_L side, then the antenna is too long and the actual resonant is *below* the design resonant frequency. If the null is on the X_C side of zero, then the antenna is too short and its actual resonant frequency is above the design resonant frequency.

3. Return the X control to zero.

4. Tune the receiver *slowly* in the direction indicated by the result of step 2.

5. Look for a null as you tune the receiver. When you find the apparent null, adjust R, X, and the receiver for deepest null (except interaction). This deepest null is the resonant frequency of the antenna.

6. Adjust the length of the antenna as indicated by the null: (a) if F_R is above the design frequency, then lengthen the antenna, or (b) if F_R is below the design frequency, shorten the antenna. Occasionally F_R will be so close to the design frequency that no action is needed.

The noise bridge is especially useful where the resonant frequency is out of the amateur bands. It also is useful inside the band, but so is a vswr bridge. We cannot, however, excite an antenna outside the band!

Half-wave Transmission Lines

It is frequently the case that we must excite antennas through transmission lines which are integer multiples of half-wavelength. Antenna impedance measurements, vswr or iswr, and similar measurements must be made either at the antenna terminals or through matching transmission lines which are integer multiples of half-wavelength. The reason for this is that the impedance is at the load and is repeated every half-wavelength down the line. Thus, if we measure the impedance (or vswr/iswr) through 0.5, 1.0, or 1.5 wavelength of coax, it is equivalent to making the measurement at the load (antenna) end.

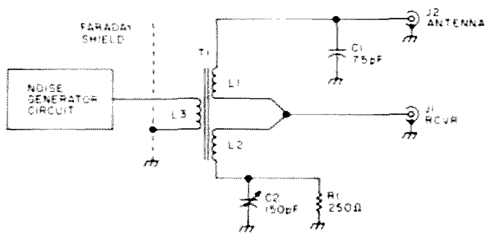


Fig. 2. Actual bridge circuit.

So how do we find half-wavelength? Some people might tell us that the length in feet is $492/F_{MHz}$, but that equation does not account for velocity factor. Since the wave velocity in the cable is a fraction (0 to 1) of the velocity in space, we must use the velocity factor (V) to reduce the physical length. The corrected length is found in Equation 1:

$$L_{ft}=492V/F_{MHz}$$

We normally use figures for V that are glibly quoted in spec sheets and antenna books (e.g., 0.66 for "regular" coax, 0.70 for Teflon™ dielectric, and 0.80 for foam dielectric). But when we actually *measure* velocity factor, we find these figures often are incorrect by as much as 25 percent—a factor that seriously affects Equation 1!

Fortunately, we can use the noise bridge to *find* half-wavelength; Fig. 4 shows how. If the coax is shorted at a point exactly one half-wavelength from the drive end, then there will be a sharp null in the noise at that frequency.

Normally, we would start with a physical length 10 percent or so longer than estimated from the equation length. We then begin shortening the coax, reestablishing the short circuit each time, until the null moves to the correct frequency. This method involves the sacrifice of a small amount of coax but yields a length that has an electrical length of exactly one half wave at the desired frequency. Some people use heavy pins or wire nails pulsed through the coax insulation to achieve the short circuit.

An alternative to the short method, as well as a check on the validity of the short method, is to use a 50–200-Ohm carbon-composition (or other noninductive) resistor in place of the short. The R dial on the noise bridge should read the same as the resistor value at half-wavelength.

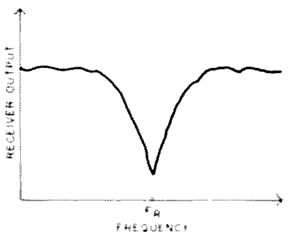


Fig. 3. Response when there is a sudden decrease in the noise level coming from the receiver.

Finding Coax Velocity Factor

The published velocity factor for coaxial cable is frequently in error. If we rely on this standard wisdom it is likely that we will at one time or another get into trouble. But it also is true that the velocity factor of any given lot of coax will have a uniform velocity factor even though it differs from the standard. Thus, if we buy a roll of cable (500 or 1000 ft. for example) and measure the actual velocity factor, then we can depend on that figure for the entire roll. From Equation 1 we know that velocity factor V is found in Equation 2:

$$V=LFN/492$$

where V is the velocity factor (0 to 1), L is the cable length in feet, F is the frequency in megahertz, and N is an integer (1, 2, 3 . . . etc.).

We can use our noise bridge to find V if we know L and can determine F on the receiver dial. A setup such as Fig. 4 is used. Measure a convenient length of coaxial cable (around 40′ will yield good results). Know (by measurement) the exact length of the cable to within an inch or two. If we assume a value for V of about 0.7, then we can calculate an approximate value for F at which N=1 (simplifies things). For example, for N=1, V=0.7, and L=40 ft., F will be approximately 8.6 MHz. We can start searching for the null at that frequency. The test procedure is as follows:

1. Set X at zero and R at just a little above zero.
2. Short the load end of the coax.
3. Adjust the receiver above and below the design frequency until a deep null is found. Record the frequency at which this null is found.
4. Using the premeasured length and the frequency found in step 3, calculate the velocity factor V using Equation 2.

You can repeat this experiment at different values of length (L) and average the results to find the "best" value of V. Once a value is determined, it can be used safely for the entire roll. You will be surprised how far removed the values actually measured are from the standard published values!

Measuring Antenna Impedance

Measuring antenna impedance with a noise bridge is very similar to the method used for finding the correct antenna length. We are assuming that the antenna is properly cut and the null is found at the correct frequency. Despite the fact that the null is on the correct frequency, it does not mean that the impedance is correct. Of course, incorrect impedance means a vswr problem.

To measure antenna impedance, we should connect the antenna to the noise bridge through a piece of coaxial cable that is electrically one half-wavelength. That way, the antenna impedance will be reflected to the input end of the transmission line where the bridge is connected. The deepest null will occur when the R control is set to the radiation resistance of the antenna. Again we are assuming that null occurs at the correct frequency. If the antenna is truly resonant, then the X control will be at zero (indicating that $X_L = X_C$). Once the impedance is known, we can determine whether or not any matching strategies are needed.

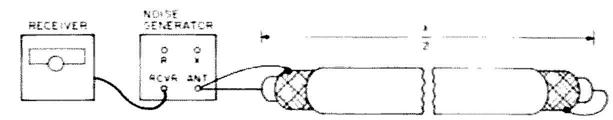


Fig. 4. Using the noise bridge to find half-wavelength.

Other Circuits

The noise bridge can be used to measure the input impedance of any tuned resonant circuit provided that the impedance is within the range of the bridge. One would not want to use the bridge on any device that is supplying power, but on passive circuits it should work nicely.

Untuned amplifiers and networks can also be tested with white noise. In those tests, one would not use the bridge portion of the instrument; only the noise-generator section is used. The circuit of Fig. 2 must be fitted with a BNC or SO-239 output connector that brings the noise signal to the outside world.

One unusual application for noise generators is in testing of signal-averaging instruments used in communications laboratories (as well as in physiology/neurology). In those applications, the noise signal and a low-amplitude sine wave are mixed in a linear summation network before being applied to the averager. If the instrument is working properly, then the noise will average to near zero while the periodic sine wave is enhanced.

The R-X noise bridge is a low-cost instrument, yet it can provide amazing results. Few items of amateur test equipment work as well or are as useful as this unfortunately neglected instrument. ■

Joseph A. Ryan WB5LLM
414 Church St., PO Box 622
Florence MS 39073-0622

Ryan's Vertical Ecstasy

Warning: Graphic depiction of vertical antenna array patterns. Explicit CoCo language. May incite construction frenzy.

Well now, this program is ideal for those desiring to experiment with designing quarter-wave vertical antenna arrays (multi-element). Formerly, unless you had the facilities of an antenna-testing laboratory available or some rather extensive equipment on hand, you had to go the old build 'n' try method.

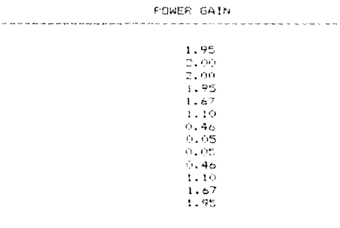
With this program (and your trusty CoCo—see below), you can design multi-element quarter-wave vertical arrays in the comfort of your shack and construct only the final selected result. It allows you to insert up to ten elements in any layout with either + or − phasing, with any power level to any element (all referenced to a reference element), see the result displayed on a simplified Smith chart, and then call up the front-to-back ratio and gain data for the array.

This is not completely original. The original version of this program was published in the May, 1980, issue of *73*, in an article by Dennis Mitchell K8UR. It was written for the TRS-80 Model I and, to use it with the TRS-80(C)—CoCo—I found that I had to extensively revise and modify it. Eventually, I wound up redoing the graphics completely in order to take advantage of the CoCo's hi-resolution capabilities. Along the way, several features were added, like output-to-printer and distance-measurement capabilities (for converting degrees of wavelength to feet for any given frequency).

The program, as written, requires the full 32K Extended Basic version of the TRS-80(C) that's apparently in use by many hams today. However, by removing the printer option, the rather long program-operating instructions (roughly lines 960 through 1120), and several other lines (see the REM statements), you could squeeze this into a 16K Extended Basic CoCo and still have the graphic output as well as the generated data.

NO. OF ELEMENTS= 2

GAIN= 3.01DB.
F/B RATIO= 29.25D/B



SYNOPSIS OF GAIN DATA

DEGREE	POWER GAIN	DB(I) GAIN
0	1.95	2.89
30	2.00	3.01
60	2.00	3.01
90	1.95	2.89
120	1.67	2.23
150	1.10	0.41
180	0.46	-3.41
210	0.05	-12.72
240	0.05	-12.72
270	0.46	-3.41
300	1.10	0.41
330	1.67	2.23
360	1.95	2.89

ELEMENT #	PHASE	ANGLE	AMPL	SPACING
2	-90	45	1	90

DISTANCE IN FEET BETWEEN ELEMENTS 1 & 2 AT 14.25 MHZ. IS 16.42 FT.

DISTANCE IN FEET FOR PHASE ANGLE OF 90 IS 16.42 FT.

DISTANCE IN FEET BETWEEN ELEMENTS 1 & 2 AT 7.24 MHZ. IS 32.32 FT.

DISTANCE IN FEET FOR PHASE ANGLE OF 90 IS 32.32 FT.

Fig. 1. Typical printout of two-element quarter-wave vertical array.

Program Restrictions and Capabilities

Now first of all, this is for quarter-wave vertical elements only. No multiband verticals count, as this program calculates for distance between elements and length of feedline between elements, which, obviously, change with frequency changes. However, if you're willing to build the result keeping in mind that you'd have to move the elements and lengthen (or shorten) the inter-element feedlines, I suppose they could be used. To be sensible, just plan on using straight quarter-wave elements (made out of TV-mast tubing and mounted on a soda bottle, if necessary).

Note that this program will calculate and display only the array's *horizontal-angle* radiation pattern. The vertical-angle radiation pattern is determined by your local effective ground (see references) and no provision has been made herein for that for two reasons: It probably would drastically increase the size of the program, and your effective-ground value changes daily (again, see the referenced article on ground effects).

This program will, however, calculate and display the array radiation pattern (horizontal), the F/B ratio, dB of gain, etc., for any arrangement of elements, spacing, and phasing.

Program Operation

A little about the program operation. Briefly, the various inputs requested are:

1. *Number of elements:* Anywhere from two to ten (this can be increased by changing the value 10 in line 80).

2. *Input relative phase:* In degrees from 0 to 360 (+ for leading and − for lagging). 360 degrees represents one wavelength, obviously. Two wavelengths would be 720, etc.

3. *Input angle of el.:* The direction, in degrees, from the reference element (0 to 360).

4. *Rel. amplitude of el.:* The power, in Watts, going to the element in question. (If equal to that going to the reference element from the transmitter, then the answer is 1; if less, because you're inserting an rf attenuator in the line, then a decimal value.)

5. *Input spacing of el.:* This is the distance from the reference element, in degrees (i.e., 90 = ¼ wave), to the element in question.

Finally, at each element step you're asked if the data you have input is correct. If not, you can answer with an N and enter the data for that element again. If your answer to the final element input is Y, then the program will go into the calculate mode.

While calculating, the program will go into the graphics mode and show the simplified Smith chart, displaying the elements as you have called for them to be assembled into an array. The view is "bird's-eye" (see the printout example, Fig. 1). *Be patient*—Basic takes time, and a full array of 10 elements could take 10-12 minutes to calculate.

Of course, you can insert the old "Vitamin E" poke—POKE 65495,0—at the beginning of the program listing, but I left it out because I run this program from disk, and without making internal modifications to the CoCo, the disk controller doesn't like this speed-up poke. If you're not running this with a disk system, you probably could use this poke, but, be sure to also insert the slow-down poke (POKE 65494,0) prior to any line calling for a printer output (if you use the printer option). This would speed up the calculating time by a factor of approximately 2, but for smaller numbers of elements it really isn't necessary.

When the calculations are complete, the screen will erase and then replay the Smith chart with the elements displayed and begin plotting the radiation pattern, one degree at a time, before your eyes (sound included). When finished, follow the prompt and hit ENTER for the display of power-gain and F/B ratio figures. Follow the prompt to display the menu of optional features.

The menu has eight choices. Item one will re-display the Smith-chart plot. Items two and three will display the power gain and gain in dB either every two degrees or (in item three) every 30 degrees. The latter is best for one screen display.

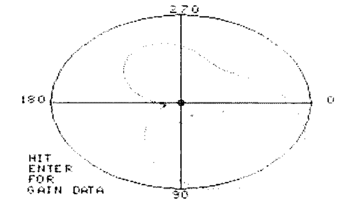
Item four is for a restart to calculate a new array. Item five will re-display only the Smith chart with the element placement, but no plot. Item six goes to a subroutine for calculating the actual physical distances between elements and the physical lengths of the feedlines between elements for a given frequency. This same subroutine is offered as part of item eight, which is the printout selection. Item seven simply re-displays the original display showing your input values for the original calculation. Item eight, should you elect to include it, needs several comments.

Printout Routine

Some of you may not elect to include this feature as its main purpose is to create a file of plotted antenna arrays in notebook or loose-leaf form. The sample printouts included herein (Figs. 1 and 2) show the results of the printout routine itself. If you choose to incorporate this system, you'll be prompted, after the majority of the data is printed out, for the distance calculations. The printout routine allows as many as you desire for as many frequencies as you want. Just remember that for a given array design, the pattern will not vary because of frequency because the calculations do not require frequen-

NO. OF ELEMENTS= 4

GAIN= 4.71DB.
F/B RATIO= 2.45D/B



SYNOPSIS OF GAIN DATA

DEGREE	POWER GAIN	DB(I) GAIN
0	2.17	3.37
30	2.79	4.45
60	2.94	4.68
90	2.41	3.82
120	1.42	1.52
150	0.50	-2.99
180	0.51	-2.94
210	1.23	0.91
240	1.78	2.50
270	1.69	2.29
300	1.30	1.15
330	1.50	1.76
360	2.17	3.37

ELEMENT #	PHASE	ANGLE	AMPL	SPACING
2	-90	90	1	90
3	-180	67.5	1	67.5
4	-135	22.5	1	112.5

```
DISTANCE IN FEET BETWEEN ELEMENTS 1 & 2 AT  14.25 MHZ. IS  16.42 FT.
DISTANCE IN FEET BETWEEN ELEMENTS 1 & 3 AT  14.25 MHZ. IS  12.32 FT.
DISTANCE IN FEET BETWEEN ELEMENTS 1 & 4 AT  14.25 MHZ. IS  20.53 FT.

DISTANCE IN FEET FOR PHASE ANGLE OF  90  IS  16.42 FT.
DISTANCE IN FEET FOR PHASE ANGLE OF  180  IS  32.84 FT.
DISTANCE IN FEET FOR PHASE ANGLE OF  135  IS  24.63 FT.

DISTANCE IN FEET BETWEEN ELEMENTS 1 & 2 AT  21.32 MHZ. IS  10.98 FT.
DISTANCE IN FEET BETWEEN ELEMENTS 1 & 3 AT  21.32 MHZ. IS   8.23 FT.
DISTANCE IN FEET BETWEEN ELEMENTS 1 & 4 AT  21.32 MHZ. IS  13.72 FT.

DISTANCE IN FEET FOR PHASE ANGLE OF  90  IS  10.98 FT.
DISTANCE IN FEET FOR PHASE ANGLE OF  180  IS  21.95 FT.
DISTANCE IN FEET FOR PHASE ANGLE OF  135  IS  16.46 FT.
```

Fig. 2. Printout of a four-element quarter-wave vertical array showing add pattern.

cy as an input. The whole program assumes that you know how to calculate the length of a quarter-wave antenna. This distance calculation is a final touch, and allows the calculation of oddball inter-element and feedline lengths.

In order to use the printout routine, some hardware consideration must be taken. This program, as listed herein, is designed to work with a Star Gemini 10 (or 10X) dot-matrix printer. The screen-dump routine, which is not part of this program, is a commercial software product (probably sold by several companies). You may have written your own for this or have a different brand of printer (i.e., Epson, Okidata, Radio Shack, etc.). If so, the DEFUSR and USRO calls in line 1390 will most certainly be different. Use your own.

If you are using a Radio Shack LP-VII/DMP-100 printer, you can use their SCRNPRT program, but insert the correct CHR$( ) figures for expanded print, etc. (see the REM statements in the listing). In all cases, load and execute the screen-dump program prior to loading and running this one. All of this, of course, only if you plan to use the printer output.

Terminology Definitions

Wavelength: In this case, the distance in degrees (0 to 360, as in a circle) from the beginning of a wave to the end. All measurements in this program are converted into feet and inches already. If you are planning a rather gigantic array with element separations greater that one wavelength, then simply add the degrees on (i.e., 1½ wavelengths = 540 degrees). The distance-calculation option allows the calculation of the linear distance between elements, etc.

Angle of element: In this case, the location of the element in question with refer-

Input Listing

```
10 CLS
20 GOSUB 960
30 CLEAR 300
40 DIM GN(360),GM(360):AA=1:BB=2
     :RD=.0174533:CV=58:CH=45
50 VI=1038:ZL=10:F$="###.##":F1=
     0:KY$=STRING$(80,"-"):X$="#
     ##.##"
60 HY$=STRING$(32,"-"):BL$=STRIN
     G$(32," "):B$=LEFT$(BL$,7)
70 PRINT@224,"INPUT NO. OF ELEM.
     (MAX.10)";:INPUT NI
80 IF NI=0 OR NI>10 THEN 70
90 CU=(NI+3)*32: GOSUB760
100 FOR N=2 TO NI
110 PRINT@CU,"INP.REL.PHASE OF E
     LE.#";N;
120 INPUT A(N):GOSUB 780:PRINT@(
     N+1)*32+7,A(N);
130 PRINT@CU,"INPUT ANGLE OF ELE
     MENT #";N;
140 INPUTO(N):GOSUB 780:PRINT@(N
     +1)*32+14,O(N);
150 PRINT@CU,"? REL.AMPL.OF ELEM
     ENT#";N;
160 INPUT K(N):GOSUB 780:PRINT@(
     N+1)*32+21,K(N);
170 PRINT@CU,"INPUT SPACING OF E
     LE. #";N;
180 INPUT B(N):GOSUB 780:PRINT@(
     N+1)*32+28,B(N);
190 PRINT@CU,"";:INPUT" DATA COR
     RECT?<Y OR N>";AN$
200 IF AN$=""THEN NEXT N
210 IF LEFT$(AN$,1)="Y" THEN NEX
     T N ELSE 110
220 GOSUB 780:GOSUB900
230 ZM=0
240 FOR J=0 TO 360STEP 2
250 FOR N=2 TO NI
260 C=(B(N)*COS((O(N)-J)*RD)+A(N
     ))*RD
270 HO=COS(C)*K(N)+HO:VT=SIN(C)+
     VT
280 GN(J)=SQR((AA+HO)^BB+(VT^BB)
     )
290 IFGN(J)>ZM THEN ZM=GN(J):P1=
     J
300 IFGN(J)<ZL THEN ZL=GN(J):P2=
     J
310 NEXT N
320 VT=0:HO=0
330 NEXT J
340 IFP1>=180THENP3=P1-180ELSEP3
     =P1+180
350 '
360 GOSUB1150
370 GOSUB1190
380 GOSUB900
390 LINE(128,15)-(128,178),PSET
400 LINE(30,96)-(229,96),PSET
410 FOR M=0 TO 360 STEP 2
420 SOUND140,1
430 IF F1=0 THEN GM(M)=GN(M)
440 GN(M)=(46/ZM)*GN(M)
450 X=COS(M*RD)*GN(M)*2.5:IFX<-1
     28 THENX=-128:IFX>128 THENX
     =128
460 Y=SIN(M*RD)*GN(M)*2.00:IFY<-
     96 THENY=-96:IFY>96 THENY=9
     6
470 PSET(128+X,96+Y,3)
480 NEXTM
490 DRAW"BM12,152;U3NU3R4NU3D3BM
     +3,0":DRAW"BM19,152;R1NR1U6
     NL1R1BM+4,+6":DRAW"BM26,152
     ;U6NL2R2BM+3,+6"
500 DRAW"BM12,162;NR4U3NR2U3R4BM
     +3,+6":DRAW"BM19,162;U6F1D1
     F2D1F1NU6BM+3,0":DRAW"BM28,
     162;U6NL2R2BM+3,+6":DRAW"BM
     32,162;NR4U3NR2U3R4BM+3,+6"
     :DRAW"BM40,162;U6R3F1D1G1L2
     NL1F3BM+3,0"
510 DRAW"BM12,172;U3NR2U3R4BM+3,
     +6":DRAW"BM19,172;H1U4E1R2F
     1D4G1L2BM+6,0":DRAW"BM26,17
     2;U6R3F1D1G1L2NL1F3BM+3,0"
520 DRAW"BM12,182;H1U4E1R2F1BM+0
     ,+2NL1D2G1L2BM+6,0":DRAW"BM
     19,182;U4E2F2D2NL4D2BM+3,0"
     :DRAW"BM26,182;R1NR1U6NL1R1
     BM+4,+6":DRAW"BM32,182;U6F1
     D1F2D1F1NU6BM+3,0"
530 DRAW"BM46,182;U6R3F1D4G1L3BM
     +7,0":DRAW"BM52,182;U4E2F2D
     2NL4D2BM+3,0":DRAW"BM59,182
     ;U6NL2R2BM+3,+6":DRAW"BM64,
     182;U4E2F2D2NL4D2BM+3,0"
540 IF INKEY$=""GOTO540 ELSE GOT
     O550
550 CLS:DB=10*(LOG(ZM)/LOG(10)):
     FB=10*(LOG(GM(P1)/GM(P3))/L
     OG(10))
560 IF F1=0 THEN DC=DB
570 PRINT@10,"NO. ELEMENT'S:";NI
     ;:PRINT@42,"GAIN: ";:PRINTU
     SINGF$;DC;:PRINT"DB";:PRINT
     @68,"F/B RATIO:";:PRINT@82,
     USINGF$;FB;:PRINT"DB";
580 PRINT:PRINT
590 F1=1
600 PRINT@480,"HIT ANY KEY FOR O
     PTIONS LIST";
610 IF INKEY$=""THEN GOTO 610
620 CLS:PRINT@7,"MENU OF OPTIONS
     ";:PRINT@32,HY$;:PRINT@64,"
     1) PLOT PATTERN";:PRINT@96,
     "2) GAIN EVERY 30 DEGREES";
     :PRINT@128,"3) GAIN EVERY 2
     DEGREES";:PRINT@192,"4) NE
     W START";:PRINT@224,"5) ELE
     MENT PLACEMENT";:PRINT@256,
     "6) DISTANCE  CALCULATIONS"
630 PRINT@288,"7) ELEMENT DATA":
     PRINT@352,"8) OUTPUT TO PRI
     NTER OF CHART &     GAIN DAT
     A, ETC.":'DELETE PRINT@352
     STATEMENT IF NO PRINTER OPT
     ION
640 X=0:Y=0:INPUT"SELECTION":LL:
     IFLL=1 THENZM=46ELSE IFLL=3
     THEN J=2
650 ON LL GOTO 380,680,700,800,8
     10,1200,670
660 T=1:GOSUB1380:'DELETE IF NO
     PRINTER OPTION USED
670 GOSUB 760:GOTO600
680 CLS:PRINTTAB(4)"SYNOPSIS OF
     GAIN DATA" :PRINTHY$;
690 J=30:REMDEGREE STEP
700 PRINT"DEGREE":TAB(8);"PWR.GA
     IN";TAB(20);"DB(I)GAIN"
710 FORI=0TO360 STEP J
720 PRINTTAB(2):I:TAB(8);:PRINTU
     SINGF$;GM(I);:IFGM(I)>=0THE
     NPRINTTAB(21);:PRINTUSINGF$
     ;10*(LOG(GM(I))/LOG(10))
730 NEXT I
740 GOTO600
750 END
760 CLS:PRINTHY$;:PRINT"EL.#":TA
     B(6);"PHASE":TAB(13);"ANGLE
     ";TAB(20);"AMPL.";TAB(26);"
     SPACE":PRINTHY$;
770 FOR I=2TON1:PRINTI;TAB(6);A(
     I);TAB(14):O(I);TAB(20);K(I
     );TAB(27);B(I):NEXT:PRINTHY
     $
780 PRINT@CU,BL$;:RETURN
790 FOR I=CU TO 869STEP64:PRINT@
     I,BL$;:NEXT:RETURN
800 CLS:CLEAR: RUN40
810 PMODE4,1:PCLS:SCREEN1,1:FOR
     PL=2 TO NI+1:IF B(PL)>BG TH
     ENBG=B(PL):NEXT
820 GOSUB1150
830 GOSUB1190
840 FOR RL=2 TO NI:XX=COS(O(RL)*
     RD)
850 XX=XX*B(RL) /BG*28+128
860 YY=SIN(O(RL)*RD)*B(RL)/BG*18
     +96:PSET(XX,YY,3):PSET(XX+1
     ,YY+1,3):PSET(XX-1,YY-1,3):
     PSET(XX+1,YY-1,3):PSET(XX-1
     ,YY+1,3)
870 NEXT RL
880 FOR V=1TO20:PSET(128,96,3):P
     SET(129,97,3):PSET(127,94,3
     ):PSET(129,94,3):PSET(127,9
     6,3):NEXT:FOR VV=1TO20:PRES
     ET(129,97):PRESET(127,94):P
     RESET(129,14):PRESET(127,94
     ):NEXT:GOTO890
890 GOTO490
900 FOR PL=2TONI+1:IF B(PL)>BG T
     HEN BG=B(PL):NEXT
910 PMODE4,1:PCLS:SCREEN1,1
920 GOSUB1150
930 GOSUB1190
940 FOR RL=2TONI:XX=COS(O(RL)*RD
     ):XX=XX*B(RL)/BG*28+128:YY=
     SIN(O(RL)*RD)*B(RL)/BG*18+9
     6:C=3:PSET(XX,YY,3):PSET(XX
     +1,YY+1,3):PSET(XX-1,YY-1,3
     ):PSET(XX+1,YY-1,3):PSET(XX
     -1,YY+1,3):PSET(128,96,3):N
     EXT
950 RETURN
960 CLS:PRINTCHR$(23):PRINT@74,"
     VERT";:FORI=1TO150:NEXT:PRI
     NT@74,B$:PRINT@78,"PLOT":FO
     RI=1TO150: NEXT:PRINT@76,B$
     :PRINT@74,"VERT";:FORI=1TO1
     50:NEXT:PRINT@78,"PLOT";:PR
     INT@85 ,"";:FORJ=1TO8:PRINT
     :FORI=1TO100:NEXT:NEXT:GOTO
     970
970 PRINT@ 68,"POLAR PLOTTING PR
     OGRAM":PRINT@102,"FOR DRIVE
     N ARRAYS":GOTO980
980 PRINT@163,"1979 - D.C.MITCHE
     LL - K8UR";:PRINT@229,"AS M
     ODIFIED FOR USE ON";:PRINT@
     260,"A TRS-80 'COLOR COMPUT
     ER'";:PRINT@334,"-BY-";:PRI
     NT@387,"1981-  J.A. RYAN -
     WB5LLM ";:FORI=1TO5000:NEXT
     :CLS:PRINTCHR$(28)
990 PRINT"  THIS PROGRAM LETS TH
     E USER DESIGN HIS ONN PHASE
     D ANTENNA ARRAYS UP TO 10 E
     LEMENTS. MORE ELEMENTS MAY
     BE USED BY CHANGING THE '10
     ' IN LINE 280 TO THE DESIRE
     D NUMBER OF ELEMENTS."
1000 PRINT"NOTE: PLOTTING TIME I
     S ABOUT 1.5 MINUTES"
1010 PRINT"FOR 2 ELEMENTS & ABOU
     T 45 SEC. LONGER PER"
1020 PRINT"EACH ADDITIONAL ELEME
     NT."
1030 PRINT@448,"HIT ENTER TO CON
     TINUE";:INPUTUU$:CLS
1040 PRINT"  TO DESIGN AN ARRAY,
     PLACE THE ELEMENTS OUT AS
     DESIRED USING A 'BIRDS EYE'
     VIEW OF THE ARRAY AND AN X
     -Y COORDINATE SYSTEM WITH 0
     -DEGREES AT THE RIGHT, 270
     AT TOP, 180 AT LEFT AND 90
     DEGREES AT THE BOTTOM."
1050 PRINT "THE PROGRAM WILL ASK
     YOU PHASE, ANGLE, AMPLITUD
     E AND SPACING, PHASE IS(-)
     FOR LAGGING AND (+) FOR LEA
     DING PHASE. PHASE IS IN DEG
     REES FROM THE REFERENCE ELE
     MENT.  CHOOSE ONE ELEMENT O
     F THE ARRAY AS A REFERENCE.
     "
1060 PRINT@448,"HIT ENTER TO CON
     TINUE";:INPUTUU$:CLS
1070 PRINT" (ALL MEASUREMENTS FO
     R THE OTHER ELEMENTS WILL B
     E TAKEN FROM THE REFERENCE
     ELEMENT CHOSEN).  ANY ELEME
     NT WILL DO.  THE ANGLE IS T
     HE ANGLE BETWEEN THE (0)DEG
     REE HEADING OF YOU X-Y COOR
     DINATE."
1080 PRINT" THE REFERENCE ELEMEN
     T WHICH IS ALWAYS AT THE CE
     NTER OF THE X-Y COORDINATE,
     AND THE ELEMENT IN QUESTIO
     N."
1090 PRINT@448,"HIT ENTER TO CON
     TINUE";:INPUTUU$:CLS
1100 PRINT"   THE AMPLITUDE IS T
     HE AMOUNT OF POWER WHICH TH
     E ELEMENT IN QUESTION RECEI
     VES COMPARED TO YOUR REFERE
     NCE.  IT IS EXPRESSED AS A
     RATIO.  THE REFERENCE ELEME
     NT ALWAYS GETS 1:1 POWER SO
     IF"
1110 PRINT" ELEMENT 2 WERE TO GE
     T TWICE AS MUCH POWER, YOUR
     INPUT WOULD BE (2) FOR AMP
     LITUDE. THE SPACING IS HOW
     FAR THE ELEMENT IN QUESTION
     IS FROM THE REFERENCE IN D
     EGREES."
1120 PRINT@448,"HIT ENTER TO CON
     TINUE";:INPUTUU$:CLS
1130 GOTO30
1140 'DON'T REMOVE LINES 1150 TO
     1330
1150 DRAW"BM120,12;NR4U1E1R1E2U1
     H1L2G1BM+7,+5":DRAW"BM129,1
     2;U1E4U1L4BM+7,+6":DRAW"BM1
     38,12;H1U4E1R2F1D4G1L2BM+6,
     0"
1160 DRAW"BM242,96;H1U4E1R2F1D4G
     1L2BM+6,0":DRAW"BM122,185;F
     1R2E1U4H1L2G1D1F1R2BM+4,+3"
     :DRAW"BM130,186;H1U4E1R2F1D
     4G1L2BM+6,0"
1170 DRAW"BM6,96;R1NR1U6G1BM+6,+
     5":DRAW"BM12,96;H1U1E1H1U1E
     1R2F1D1G1NL2F1D1G1L2BM+6,0"
     :DRAW"BM20,96;H1U4E1R2F1D4G
     1L2BM+6,0"
1180 RETURN
1190 CIRCLE(128,96),100,,.825:CI
     RCLE(128,96),3,,1:RETURN
1200 CLS:PRINT@2,"DISTANCE BETWE
     EN ELEMENTS AND PHASING CAL
     CULATIONS":PRINT:PRINT:PRIN
     T"FREQ. IN MHZ.(TO NEAREST
     .00)"
1210 INPUTR
1215 FOR I=2 TO NI
1220 XX=936/R:YY=XX/360:ZA(I)=YY
     *A(I):ZB(I)=YY*B(I)
1225 PRINT"DIST. IN FT. BETWEEN
     ELEMENTS";:PRINT "1 &";I;:P
     RINT"AT ";R;:PRINT"MHZ. IS
     ";:PRINTUSINGX$:ZB(I);:PRIN
     T"FT":NEXTI
1230 FOR I=2 TO NI
1240 XX=936/R:YY=XX/360:ZA(I)=YY
     *A(I):ZB(I)=YY*B(I)
1250 NEXTI
1260 PRINT:PRINT
1270 '
1280 IF T=1 THEN GOTO 1340 ELSE
     GOTO 1290
1290 FOR I=2 TO NI:PRINT "DIST.
     IN FT. FOR A PHASE ANGLE O
     F";:PRINT(A(I)*-1);:PRINT"
     IS";:PRINTUSINGX$;(ZA(I)*-1
     );:PRINT"FT.":NEXTI
1300 PRINT:PRINT
1310 INPUT"DO YOU WANT ANOTHER D
     ISTANCE    CALCULATION    (
     Y=YES, N=NO)";C$
1320 IF C$="Y" THEN GOTO 1200
1325 IF C$<>"Y" AND T<>1 THEN GO
     TO620
1330 IF C$<>"Y" THEN PRINT#-2,CH
     R$(12):GOTO 620
1340 CLS:PRINT@130,"PRINTOUT OF
     DISTANCE CALCULATION":PRINT
     #-2," ":FOR I=2 TO NI:PRINT
     #-2,"DISTANCE IN FEET BETWE
     EN ELEMENTS";:PRINT#-2," 1
     &";I;:PRINT#-2,"AT ";:PRINT
     #-2,USINGX$;R;:PRINT#-2," M
     HZ. IS ";:PRINT#-2,USINGX$;
     ZB(I);:PRINT#-2," FT.":NEXT
1350 PRINT#-2:FOR I=2 TO NI:XX=9
     36/R:YY=XX/360:ZZ(I)=YY*A(I
     )
1360 PRINT#-2,"DISTANCE IN FEET
     FOR PHASE ANGLE OF ";:PRINT
     #-2,(A(I)*-1);:PRINT#-2," I
     S ";:PRINT#-2,USINGX$;(ZA(I
     )*-1);:PRINT#-2," FT."
1370 NEXTI:GOTO1310
1380 CLS:PRINT@132,"SENDING TO P
     RINTER":GOSUB 1400:REM PRIN
     TER ROUTINE FROM HERE TO 15
     00
1390 POKE150,1:DEFUSR1=&H7E00:Y=
     USR1(0):CLS:GOTO1410
1400 POKE150,1:PRINT#-2,;" ":PRI
     NT#-2,TAB(10);"NO. OF ELEME
     NTS= ":NI;:PRINT#-2,TAB(64)
     ;"GAIN= ";:PRINT#-2,USINGF$
     ;DC;:PRINT#-2,"DB.":PRINT#-
     2,TAB(59);"F/B RATIO= ";:PR
     INT#-2,USINGF$;FB;:PRINT#-2
     ,"D/B";:PRINT#-2," ":RETURN
1410 CLS:PRINT@132,"PRINTOUT OF
     GAIN DATA":PRINT#-2," ":PRI
     NT#-2," "
1420 PRINT#-2,CHR$(14);TAB(10);"
     SYNOPSIS OF GAIN DATA":PRIN
     T#-2,KY$
1430 PRINT#-2,CHR$(20);:PRINT#-2
     ,TAB(10);"DEGREE";:PRINT#-2
     ,TAB(38);"POWER GAIN";:PRIN
     T#-2,TAB(66);"DB(1) GAIN":P
     RINT#-2,KY$:PRINT#-2," "
1440 J=30:FOR I=0 TO 360 STEP J
1450 PRINT#-2,TAB(10);I;TAB(39);
     :PRINT#-2,USINGF$;GM(I);:IF
     GM(I)>=0THENPRINT#-2,TAB(68
     );:PRINT#-2,USINGF$;10*(LOG
     (GM(I))/LOG(10))
1460 NEXT I
1470 CLS
1480 CLS:PRINT@130,"PRINTOUT OF
     ELEMENT DATA":PRINT#-2," ":
     PRINT#-2," ":PRINT#-2,KY$
1490 PRINT#-2,TAB(10);"ELEMENT #
     ";:PRINT#-2,TAB(30);"PHASE"
     ;:PRINT#-2,TAB(50);"ANGLE":
     :PRINT#-2,TAB(60);"AMPL";:P
     RINT#-2,TAB(70);"SPACING"
1500 FOR I=2TONI:PRINT#-2,TAB(12
     );I;:PRINT#-2,TAB(31);A(I);
     :PRINT#-2,TAB(50);O(I);:PRI
     NT#-2,TAB(62);K(I);:PRINT#-
     2,TAB(72);B(I):NEXTI:PRINT#
     -2,KY$:GOTO1200
1510 END
```

ence to the center of the chart and the reference element, in degrees around the compass (i.e., 45 degrees would be northeast).

Relative phase: Refers to the measurements, again as described above, except here it refers to the length of the feedline between the reference element and the element in question (or the prior element if the elements are in series).

REL(ative) AMPL(itude) of element: Refers to the amount of power this element receives (in the transmit mode) with respect to the reference element. If the power to the element in question is the same as that of the reference element, then the answer would be 1. If it is twice as much, the answer would be 2, and if half as much, .5 (here using an attenuator). In receiving-only

Cross-Reference
Label References

```
00030    01130
00040    00800
00070    00080
00380    00650
00490    00890
00540    00540
00550    00540
00600    00670  00740
00610    00610
00620    01325  01330
00670    00650
00680    00650
00700    00650
00760    00090  00670
00780    00120  00140  00160  00180
         00220
00800    00650
00810    00650
00890    00880
00900    00220  00380
00960    00020
00970    00960
00980    00970
01150    00360  00820  00920
01190    00370  00830  00930
01200    00650  01320  01500
01290    01280
01310    01370
01340    01280
01380    00660
01400    01380
01410    01390
A()      00120  00120  00260  00770
         01220  01240  01290  01350
         01360  01500
AA       00040  00280
AN$      00190  00200  00210
B$       00060  00960  00960
B()      00180  00180  00260  00770
         00810  00810  00850  00860
         00900  00900  00940  00940
         01220  01240  01500
BB       00040  00280  00280
BG       00810  00810  00850  00860
         00900  00900  00940  00940
BL$      00060  00060  00780  00790
C        00260  00270  00270  00940
C$       01310  01320  01325  01330
CH       00040
CU       00090  00110  00130  00150
         00170  00190  00780  00790
CV       00040
DB       00550  00560
DC       00560  00570  01400
F$       00050  00570  00570  00720
         00720  01400  01400  01450
         01450
F1       00050  00430  00560  00590
FB       00550  00570  01400
GM()     00040  00430  00550  00550
         00720  00720  00720  01450
         01450  01450
GN()     00040  00280  00290  00290
         00300  00300  00430  00440
         00440  00450  00460
H7       01390
HD       00270  00270  00280  00320
HY$      00060  00620  00680  00760
         00760  00770
I        00710  00720  00720  00720
         00720  00730  00770  00770
         00770  00770  00770  00770
         00790  00790  00960  00960
         00960  00960  00980  01215
         01220  01220  01220  01220
         01225  01225  01225  01230
         01240  01240  01240  01240
         01250  01290  01290  01290
         01290  01340  01340  01340
         01350  01350  01350  01360
         01360  01370  01440  01450
         01450  01450  01450  01460
         01500  01500  01500  01500
         01500  01500  01500
J        00240  00260  00280  00290
         00290  00290  00300  00300
         00300  00330  00640  00690
         00710  00960  01440  01440
K()      00160  00160  00270  00770
         01500
KY$      00050  01420  01430  01480
         01500
LL       00640  00640  00640  00650
M        00410  00430  00430  00440
         00440  00450  00450  00460
         00460  00480
N        00100  00110  00120  00120
         00120  00130  00140  00140
         00140  00150  00160  00160
         00160  00170  00180  00180
         00180  00200  00210  00250
         00260  00260  00260  00270
         00310
NI       00070  00080  00080  00090
         00100  00250  00570  00770
         00810  00840  00900  00940
         01215  01230  01290  01340
         01350  01400  01500
O()      00140  00140  00260  00770
         00840  00860  00940  00940
         01500
P1       00290  00340  00340  00340
         00550
P2       00300
P3       00340  00340  00550
PL       00810  00810  00810  00900
         00900  00900
R        01210  01220  01225  01240
         01340  01350
RD       00040  00260  00260  00450
         00460  00840  00860  00940
         00940
RL       00840  00840  00850  00860
         00860  00870  00940  00940
         00940  00940  00940
T        00660  01280  01325
UU$      01030  01060  01090  01120
V        00880
VI       00050
VT       00270  00270  00280  00320
VV       00880
X        00450  00450  00450  00450
         00450  00470  00640
X$       00050  01225  01290  01340
         01340  01360
XX       00840  00850  00850  00860
         00860  00860  00860  00860
         00940  00940  00940  00940
         00940  00940  00940  00940
         01220  01220  01240  01240
         01350  01350
Y        00460  00460  00460  00460
         00460  00470  00640  01390
YY       00860  00860  00860  00860
         00860  00860  00940  00940
         00940  00940  00940  00940
         01220  01220  01220  01240
         01240  01240  01350  01350
ZA()     01220  01240  01290  01360
ZB()     01220  01225  01240  01340
ZL       00050  00300  00300
ZM       00230  00290  00290  00440
         00550  00640
ZZ()     01350
```

conditions, the answer would always be 1.

Input spacing of ELE(ment): Refers to the distance between the reference element and the element in question. This is not necessarily the same as relative phase, above.

That's it! Experiment with it. You'll get some surprises when it comes to various values you pump into the phase-angle and distance inputs as well as the layout of the array. A typical two-element array with the elements and phase angle set at 90 (and −90) degrees (a quarter-wave) will give a heart-shaped radiation pattern with a 3.0-dB gain and a 32-dB F/B ratio. Try others, including situations where the distances are less than the phase-angle figure.

Type carefully, especially from line 860 to line 950. ■

References

Dennis Mitchell K8UR, "Antenna Engineer," *73*, May, 1980.
Joe Hypnarowski WA6VNR, "Effective Grounds," *CQ*, August, 1982.

Try Low and Behold

Here's a shock: You've been wasting money on towers and poles. W1GV explains why low antennas may outperform high-altitude aluminum.

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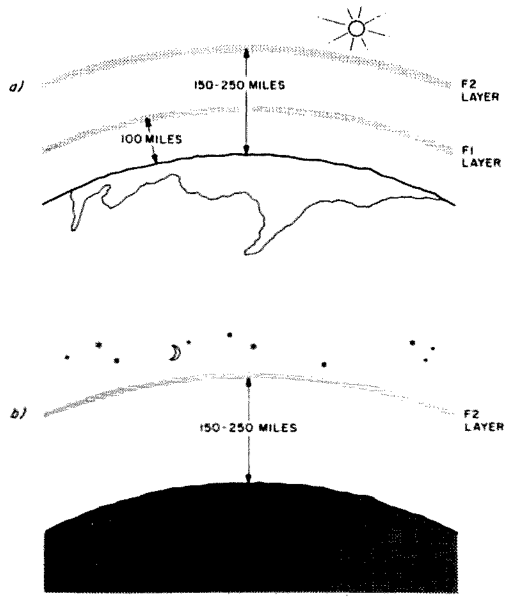

Fig. 1. During the hours of daylight, the ionospheric F layer sometimes splits into two parts, as shown at (a). These regions occur at altitudes of about 100 miles (the F1-layer) and 150 to 250 miles (the F2-layer). During the hours of darkness and occasionally during the day, the F layer consists of a single ionized region at an altitude of 150 to 250 miles.

We all have heard that the higher we put an antenna the better it will work. But this is not always true! Especially if you are a contester, you can benefit from a knowledge of how antenna height affects propagation distance.

You have just gone to a tremendous amount of trouble—not to mention expense—to put your tribander up another 40 feet. The new 90-foot tower graces your neighborhood. You drive up the street with pride. Lay persons gape at the structure with awe. A space-age communicator genius, that's you!

Finally, everything is hooked up and ready to go. You anxiously switch on the rig and tune to 14.225 MHz, getting ready for some DX. Sure enough, there's a CX3. You call him with the linear off, just for fun. A dozen others call him at the same time. You win.

A JA station calls you and tells you that you are the strongest signal he has heard so far that morning. Morning? It's 7:00 pm! Oh, yes . . . jet lag.

It works!

Now for a little domestic chatter. You tune further up the band. Strange . . . all of the stateside stations seem weak. Well, you guess, it must just be the conditions. Twenty meters can be a fickle band. You call CQ. No answer. Again. No answer.

A moderately strong W5 station is calling CQ. You answer. He comes back to someone else.

Several more failures transpire before you make a stateside contact. But he tells you that your signal is just S3. Imagine! What an insult!

Several evenings pass and half a Saturday before you allow yourself to wonder what's happening. DX seems great, but you'll get creamed in the sweepstakes.

No Coincidence

There's an old saying that something isn't a coincidence if it keeps on happening. Your new skyscraper antenna system just doesn't seem to work that well un-

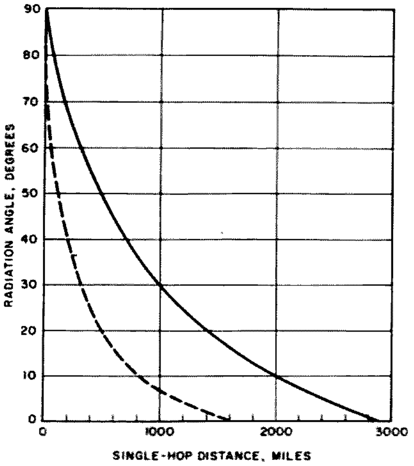

Fig. 2. The single-hop distance is related to the angle of radiation from the antenna, and also to the altitude of the ionized layer. The solid line shows the relation for the F2 region for the average altitude of 200 miles. The dotted line shows the relation for the F1-layer, for the average altitude of 100 miles.

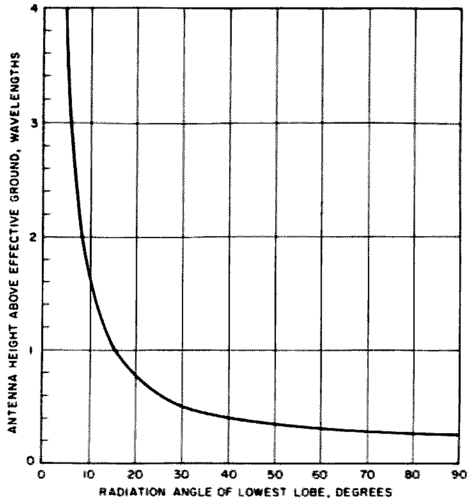

Fig. 3. The lowest lobe of radiation in the vertical plane occurs at an angle that is a function of the height of the antenna above effective ground. The lowest radiated lobe is of primary interest in most cases.

less the other station is at least a couple of thousand miles away. As the weeks pass, you begin to notice that this effect is even more pronounced on 15 meters than on 20. And on 10 meters, it is still more vivid, although it could well be the large skip zone that is responsible for the phenomenon on that band.

What causes this?

For horizontal antennas, the angle of radiation depends on the height of the antenna above the effective ground. The higher the antenna above effective ground, the lower the angle of radiation. Your antenna is high. Therefore, you can be pretty certain that the angle of radiation is low. But is that good? For DX, yes, it is good. But for contacting stations closer in, it may not be so good. Your signal might be going "over their heads."

If you are primarily a domestic contester, you can benefit from a knowledge of the way in which antenna height affects the single-hop propagation distance. By placing your antenna at just the right height so the strongest part of your signal will land in a densely populated area, you can gain an advantage over a competitor who ignores the physics of antenna height versus performance.

Single-Hop Distance

How far from your station will the strongest part of your signal come back to Earth? That depends on the altitude of the ionosphere at the time and also on the angle of radiation from your antenna.

Most propagation in the high-frequency bands takes place via the F layer of the ionosphere. This layer often breaks into two levels during the daytime; signals are then returned by a region that is about 100 miles high. At night, the F layer ranges from approximately 150 to 250 miles altitude, with the average being about 200 miles. This is shown in Fig. 1.

Since the ionized layer is usually higher at night than during the day, signal range can be expected to increase during the hours of darkness. And this is generally what does happen. If your antenna radiates most of its energy right along the horizon—that is, if the elevation angle is zero degrees—the signal will "land" about 1,600 miles away during the daytime and about 3,000 miles away at night. That's the maximum possible single-hop distance. The limiting factor is the curvature of the Earth.[1]

Of course, multiple-hop propagation makes it possible to talk with hams all over the world. In general, the lower your angle of radiation, the fewer hops are required for global propagation. That's why a low angle of radiation is favored for DX. The fewer hops your signal must take to get to the opposite side of the world, the lower the attenuation will be.

But suppose you live in Washington, DC, and want to talk with someone in New York City. If your angle of radiation is very low, most of your signal will overshoot its goal. You'll be heard very well in Greenland, perhaps, but not in the Big Apple.

The distance at which your signal "lands" after a single hop is a direct function of the angle of radiation. The lower the radiation angle with respect to the horizon, the greater the propagation distance. Fig. 2 is a graph illustrating the function of one-hop distance versus radiation angle, based on the average F1-layer (daytime) height of 100 miles and the average F2-layer (nighttime) height of 200 miles.

What Affects the Angle of Radiation?

So, you ask, how does one control the angle of radiation from an antenna at the high frequencies? The answer is that a horizontally-polarized antenna, such as a dipole or yagi, exhibits an optimum angle of radiation that varies directly with the antenna height above the effective ground plane. (A vertical antenna, assuming it has a good ground system, always radiates best at relatively low angles.)

The higher you put your antenna, the lower the angle of radiation will be, as a general rule.

We should take note that, at 160 meters, it's practically impossible to control the angle of radiation from a horizontal antenna. Unless you live in the wide-open country and still have to register your tower with the Federal Aviation Administration, you can stop worrying about the problem on that band. A horizontal antenna for 160 meters radiates most of its energy at very high angles, unless you put it at least

250 to 300 feet above the ground. That's not easy! A vertical antenna radiates at somewhat lower angles—provided a good radial system is installed. At 160 meters the installation of an excellent radial system is no small task, either.

At 80 meters, the problem still will not concern most of us. An 80-meter dipole must be at least 125 to 150 feet up for the angle of radiation to drop much from the zenith.

At 40 meters, the situation becomes different. For short-range communication, a height of 30 to 40 feet is best; for intermediate-range, 50 to 75 feet is optimum. That is not unreasonable for many hams (although for some it's an utter impossibility). For long-distance work, the old DXer's rule applies: Put the antenna up as high as you can.

At 30 meters and above, modest antenna height can result in an angle of radiation that might be lower than you want it.

How do we determine the maximum angle of radiation from a horizontal antenna, in terms of its height?

First, we must realize that the effective ground plane for radio-frequency energy usually doesn't coincide with the actual Earth surface. For flat, level ground without man-made structures, the effective radio-frequency ground plane lies several feet below the surface.[2] Obstructions such as trees, utility wires, house wiring and roofing, and steel-frame buildings can raise the effective ground plane. In an area congested with steel-frame buildings, the effective radio-frequency ground plane may be well above the level of the Earth's surface.

For the average residential dweller, the effective ground plane is probably a little bit below the actual surface. In the city where there are many tall buildings of widely varying stature, it can be difficult to estimate the level of the effective ground plane because of the irregular distribution of obstructions and because the effect of such obstructions varies with the wavelength. If your QTH is in the downtown area of a sizable metropolis, you'll probably have to resort to trial and error to find out how your antenna height affects the angle of radiation—if you have any control over the situation at all.

The effective height of an antenna is, in general, a little greater than its actual height in most suburban or rural locations. To obtain the effective height, add about 5 feet to the actual height.

Once you have determined the angle of radiation that you want, using Fig. 2, you can determine the optimum height for your antenna, in wavelengths, from Fig. 3. Where do we get Fig. 3? The signal from your yagi antenna goes out in all directions. Although much of the energy is propagated horizontally because of the directional nature of the antenna, some goes straight up and some goes straight down; some goes up and down at 30-degree angles with respect to the horizon. Overall, half of the energy is emitted toward points above the horizon and half is sent out toward points below the horizon—that is, toward the ground. The ground signal is reflected at the effective ground plane and is reversed in phase. It then heads back up into the sky, toward the ionosphere.

The familiar rule of optics applies to radio waves just as it applies to rays of light: The angle of reflection is equal to the angle of incidence. Ground reflection occurs at all possible angles of incidence; energy sent straight down from your antenna gets sent straight up, energy sent down at a 30-degree angle gets reflected back up at a 30-degree angle. Ground reflections occur over a large area surrounding your antenna.

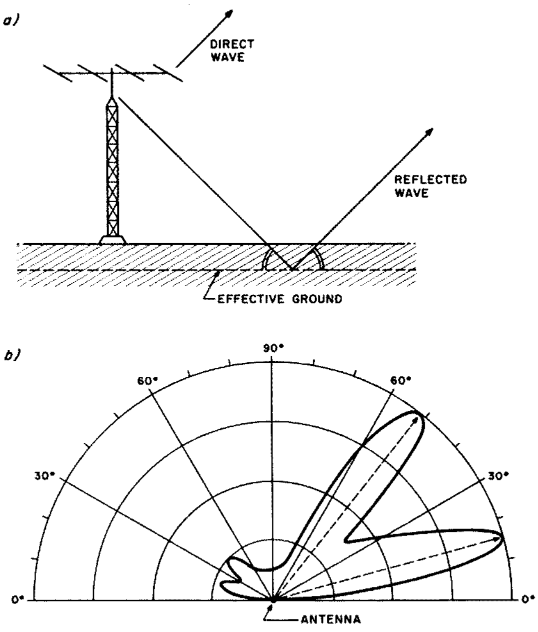

Fig. 4. The direct wave and the ground-reflected wave combine, at a distant point in the sky, in varying phase, depending on the takeoff angle. At (a) an example is shown of how these waves are emitted from a yagi antenna. At (b) a typical vertical-plane radiation pattern is illustrated for a yagi antenna at a height of a little less than 1 wavelength. (The lower lobe is of primary interest in most cases.)

At great distances and altitudes, the direct wave and the ground-reflected wave combine in varying phase, depending on the angle above the horizon. Fig. 4(a) illustrates the geometry of the situation. Fig. 4(b) shows an example of the sort of radiation pattern that occurs. This phase pattern is quite complicated, but it can be determined by simple plane geometry. The lowest lobe—the one that occurs nearest the horizon—contains the most signal energy of any lobe. The angle at which this lobe occurs, as a function of the height in wavelengths, is the lowest angle at which the direct and ground-reflected waves add in phase. It is this angle, as a function of the antenna height in wavelengths, that is shown in the graph of Fig. 3.

Optimum Angle Versus Height in Feet

Most of us have antennas that stay at the same height all of the time. Variable-height towers exist (but those of us who have "crankups" generally think of such towers more as "crankdowns"—to keep the neighbors from suing for half the gross national product because of the eyesore), and from the above discussion it should be evident that they can be used to advantage in medium-range operation.

Your antenna height in wavelengths can be determined by a simple formula, assuming you know the frequency or wavelength and the height of your antenna in feet. The following formula applies, letting h represent the height in feet above the actual ground surface, f the frequency in megahertz, and y the effective antenna height in wavelengths: $y = (h + 5)f/984$.

For example, suppose your antenna is 50 feet above the ground surface. Then the height in wavelengths above effective ground, at 14 MHz, is $(50 + 5) \times 14/984$, or 0.78 wavelengths. At this height, the optimum angle of radiation from your antenna can be determined, from Fig. 3, as approximately 20 degrees.

Now, using Fig. 2 you can find the one-hop distance for F1-layer or F2-layer propagation. During the day you should expect a distance of pretty close to 500 miles via the F1-layer, assuming this layer is ionized at that time. (If not—and the F1-layer is not always ionized during the daylight hours—the propagation will occur via the F2-layer.) At night or if the F1-layer is not ionized, you can expect the propagation distance to be about 1400 miles.

Let's try this in reverse. Suppose you want to keep a schedule with a friend whom, after you have checked on a map with a ruler against the mileage scale, you have determined is 1640 miles away. You decide to try 14 MHz, since that band has been pretty good lately. How high should your antenna be, assuming you want to have the sked at 9:00 pm?

Look at Fig. 2, at the F2-layer (nighttime) line, and you can see that the optimum angle of radiation is about 15 degrees. How high should your antenna be? Checking Fig. 3, you can see that the height should be just about 1 wavelength above effective ground.

Now, we must convert this value to feet. The "inside-out" version of the above formula can be used for this purpose: $h = 984y/f - 5$. At 14 MHz, with $y = 1$, we have $h = 984 \times 1/14 - 5$, or $h = 65$ feet. This isn't terribly high. If your tower is 90 feet high, you may well overshoot your target.

Conclusion

Neither the ground nor the ionosphere is perfectly predictable. Certainly there will be exceptions, in practice, to the guidelines given here. The most notable exception is that the F1-layer may fail to ionize during the daytime and you cannot tell until you find out by trial and error. The ionized layers vary somewhat in height, as well, and thus the above formulas are not exact. The effective ground plane in your location may not be exactly 5 feet below the actual surface.

We are dealing with variables. But it is certainly better to have some idea of how high you should put your antenna, instead of no idea whatever, or a grossly erroneous notion. The above information should give you a very good idea!

Probably the best approach for optimizing antenna height is the crankup tower or, better still, a mast or tower with an electric motor so you can raise or lower your antenna by remote control from the station. This would allow you to actually listen to the signals from a certain area, and thereby optimize your antenna height empirically (after getting the general idea by using the graphs and formulas given here).

Antenna height is, at the high frequencies, only slightly less important than the direction in which it is pointed. We would not think of pointing a yagi west if we wanted to work a station to the south of us. Similarly, an antenna that is far too high (or, less frequently, not high enough) can detract from the signal strength. The contest operator, especially, should attempt to optimize the antenna height as well as its direction. A slight edge can, as we know, make a big difference. Number 2 differs from 1 by 100 percent! ■

References

1. *The ARRL Antenna Book*, 13th Edition, 4th Printing, The American Radio Relay League, Inc., Newington CT, 1977, page 17.
2. *Ibid.*, page 46.

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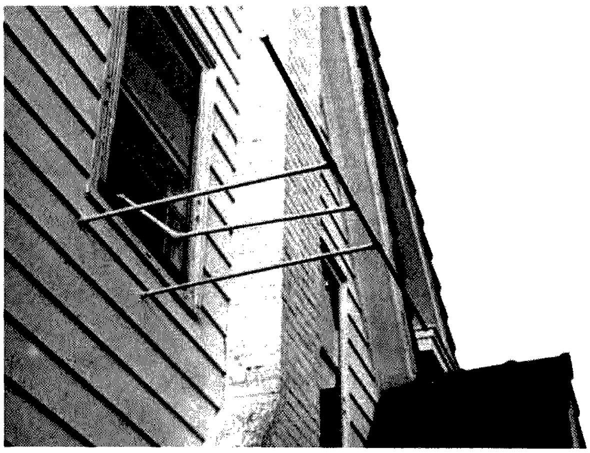
A No-Holes Barred Beam

What to do when the lease says "no antennas": Turn your entire house into a broadside dipole.

Problems common to amateur-radio operators who rent homes or apartments or live in condominiums or townhouses are restrictions on antennas. I rent the house that I presently live in and miss the freedom to put up towers or antennas indiscriminately. However, I have not given up. Examples of my past solutions to this antenna problem (for the microwave spectrum) have been reported in this journal.[1]

A more recent antenna project was to improve reception of a distant channel 2 television station. The station, in North Carolina, is the only station within 150 miles that carries "Monty Python's Flying Circus"—a program to which my wife and I are thoroughly addicted. Our landlord, who has a strong distaste for Monty Python humor, will not permit a three-element beam for channel 2 to be mounted on the chimney. What does this have to do with amateur radio? Channel 2 is close in frequency to six meters, and the antenna presented here can easily be scaled for six-meter, 10-meter, and 15-meter operation or scaled up in frequency for 2-meter or 1¼-meter operation.



The window-mounted VHF antenna.

An essential element of the design of this antenna is the design of the house. My house meets the two design requirements. First, one side faces the television station that I wanted to receive. Second, the house has aluminum siding. Up to this time, I had considered the aluminum siding to be a drawback. What amateur-radio operator wants to live in a shielded box? But now I had a use for the siding; it forms a reflector screen for a single-element broadside antenna—see Fig. 1.

The driven element is a half-wave folded dipole. (Even though the antenna is used only for reception, the active element is called the driven element.) The folded dipole is made from 300-Ohm twinlead. The length of the folded dipole is found by: L (ft.) = 492/f(MHz) × .95 × .82. The factor 492 accounts for the speed of light in English units, fringing effects are represented by the factor 0.95, and 0.82 is the velocity factor of common television twinlead. If open-wire construction is used, omit the 0.82 factor.

The driven element is fed with twinlead although the feed impedance is probably closer to 200 Ohms. A 4-to-1 coaxial balun would probably result in a good impedance match to 50-Ohm cable. The driven element is spaced 0.2 wavelengths in front of the siding; S (ft.) = 984/f(MHz) × 0.2.

Simple enough? Yes, but the hard part is how to construct and mount the antenna without drilling holes, and still be able to rapidly erect or remove it. The solution I found is shown in Fig. 2.

A frame is constructed using PVC plumbing tubing. This modern synthetic material is cut easily with a hacksaw and spliced with a fast-curing cement. Remember when glue and paint would dry? Now it cures, hardens, fuses, or passes through some chemical metamorphosis! Anyway, T fittings, elbows, 45-degree bends, and end caps are readily available at most hardware stores.

The frame hooks onto

the windowsill and is held spaced away from the house by two legs. The legs have end caps to prevent them from marking the siding. The folded dipole is inside the long horizontal piece. The feedline is inside the center leg. The antenna shown was constructed from ½-inch (inside diameter) white tubing. The white tubing is almost invisible against the white siding. For ten-meter or longer wavelength bands, I would recommend one-inch or larger tubing. For six-meter and higher frequencies, I would stay with the cheaper ½-inch tubing.

The central leg was fabricated first. After the feedline was threaded down the tubing, the driven element was soldered to the feedline. The driven element was laced to a long, thin wooden stick to prevent it from twisting. Then short sections were added to each side, the spacer legs added, and finally the end sections cemented on, complete with end caps. The completed antenna quickly hooks in place. When not being used, it is lowered with a cord down behind the bushes.

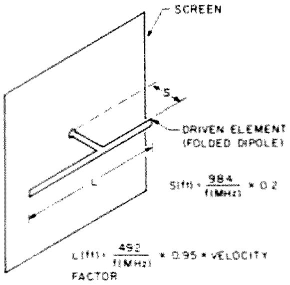


Fig. 1. Single-element broadside antenna.

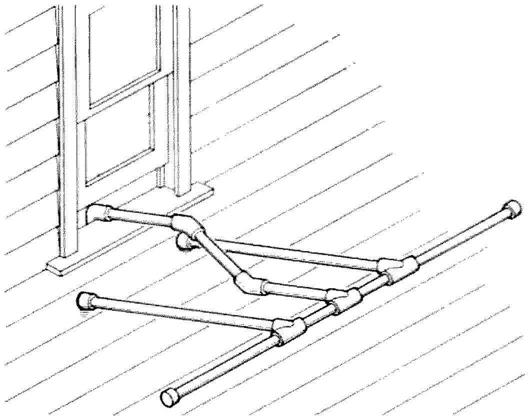


Fig. 2. PVC window mounting.

The antenna has been a complete success and is still in use. The total cost including cement, tubing, and twinlead was less than fifteen dollars. The design can readily be scaled to amateur frequencies. One could be mounted on each of four walls to achieve omnidirectional coverage. The beam pattern can be widened by increasing the dipole-to-wall spacing to three-eighths wavelength. The center and spacer legs could be left uncemented and assembled with a lock pin or screw to allow the antenna to be collapsed enough to pass through the window and eliminate lowering it down after use. (Because of the way siding is mounted, this method is usable only for horizontally-polarized antennas.) Build one and let me know how you like it. ■

Reference

1. "Try the GHz Getter," *73*, October, 1982, pp. 50–52, and "The Amazing Cylindrabola," *73*, September, 1983, pp. 54–55.

Another Eggbeater

Don't be a VHF weakling. Pump up your performance with this simple 2m omni.

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Many two-meter antenna construction articles have appeared in the past, probably more than necessary. Even so, here is my adaptation of an antenna from the April, 1971, issue of *QST*. The antenna was called an eggbeater. It is two full-wave loops mounted at right angles and fed 90 degrees out of phase to produce an omnidirectional, horizontally-polarized antenna. The round loops were changed to the more familiar square configuration. The feedline is attached to the side to produce vertical polarization. The phasing and feedlines are twinlead (300 Ohms). The balanced line is brought into the shack where a tuner is used to match to 50 Ohms.

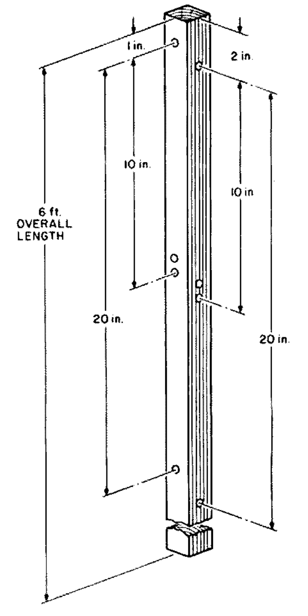


Fig. 1. Center-support drilling guide.

Construction

The antenna uses a six-foot piece of wood (1″ × 1″) as its center support. Two twenty-inch cross pieces are used (I used scrap pieces of molding, but 1″ × 1″ wood will work just as well).

In preparing the center support for mounting the elements, it will be necessary to drill two holes at the top at right angles to each other. See Fig. 1. The exact size will depend on the type of wire used for the elements; just make the holes large enough for a snug fit. Measure twenty inches down from each of the top holes and drill two more holes for the bottom of the wire elements. See Fig. 1. Mount the twenty-inch cross pieces ten inches from the top holes. Use two small screws to fasten each boom to the center support. See Fig. 2.

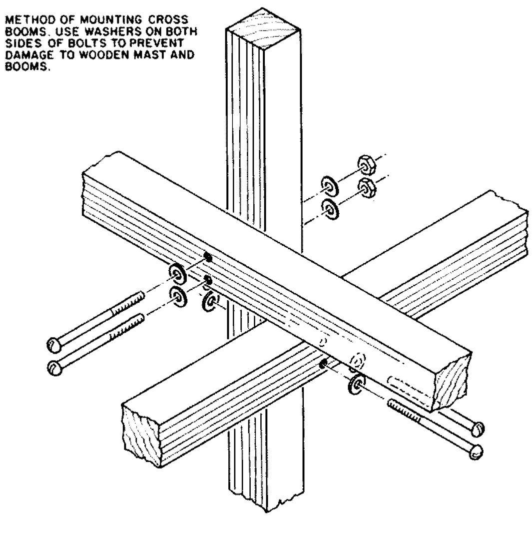


Fig. 2. Cross-boom mounting method.

Feedpoint insulators are Plexiglas™, three inches long and one and a half inches wide. These are attached to the cross booms with small screws. Holes are drilled one inch from each end of the Plexiglas insulators, and the feedline and wire elements are attached here. See Fig. 3. You can use solder lugs and screws to hold these wires to the insulator (or washers and screws). The first method with soldered connections is recommended.

Insert the wire for the elements in the holes and bend them into a square shape twenty inches on a side. See Fig. 4. Use #12 copper, either bare or insulated. You can use a larger size of aluminum wire, but this will make it necessary to experiment with the length to achieve resonance. The wire used in this model is #12 copper that is 81 inches long and was salvaged from a piece of electrical service wire.

The feedpoints for the antenna are attached to the insulators and the opposite sides of the loop are held to the cross booms with fishing line. See Fig. 4. Two small holes are drilled and the fishing line is wrapped around the element and the

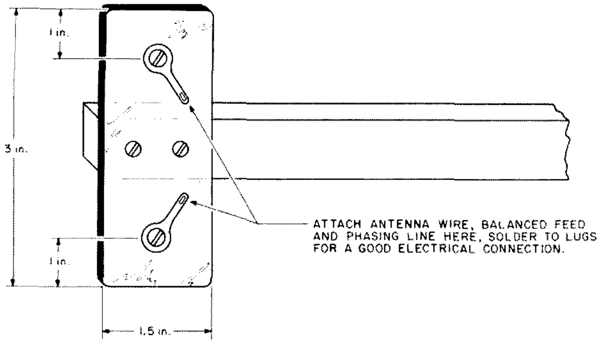
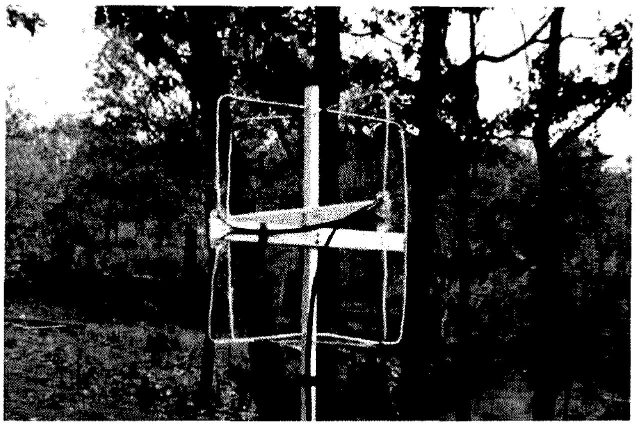


Fig. 3. A Plexiglas™ insulator.



The vertical eggbeater for two meters.

boom about ten times at each hole. A dab of epoxy glue covers the wire and fishing line.

Attach the phasing line between the two feedpoints. I use twinlead sixteen inches long. The main feedline is also 300-Ohm twinlead and is connected to either element. The feedline is then taped to the wooden center support. See Fig. 4. Electrical tape is used to secure the phasing line also. *Standoff* insulators are used on the metal parts of the mast.

Conclusion

Use a good grade of twinlead and plenty of standoffs to preserve the balance of the line. Weatherproof the wood used (several coats of paint or spar varnish will do). Let me point out that it isn't necessary to use wood. One model of this antenna used PVC for the center support and cross booms. I use ten Watts of power and have encountered no problems. With higher power you may need to use the transmitting type of twinlead or open-wire line.

While the antenna won't outperform even a small yagi, it doesn't require a rotor to aim the antenna; it has been a great improvement over the various ground planes and vertical dipoles I've used in the past.

I haven't tried stacking the vertical eggbeater, but it should give some gain and a lower angle of radiation. You've got to admit the price is right, so build one or even stack two or more, and enjoy. ■

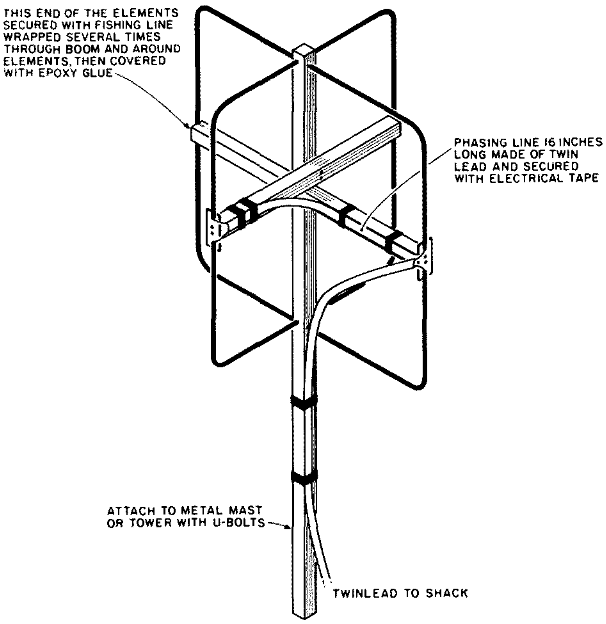


Fig. 4. The finished product.

Parts List

2 #12 copper wire—81 inches long
1 1" × 1" wood—six feet long
2 1" × 1" wood—20 inches long
2 Plexiglas™ for insulators—1.5" × 3"—use the thickest type you can find.
Screws, nuts, and washers to mount the insulators and booms
Solder lugs and standoff insulators (if balanced line is used)
U-bolts to mount center support to mast

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73 INTERNATIONAL

Each month, 73 brings you ham-radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

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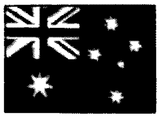

AUSTRALIA

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Most amateurs accept "pirates" as a fact of life on the amateur bands, and some pirates have eventually become well-known amateurs after they have realized what they are missing by running unlicensed operations.

But when a well-organized pirate operation starts to put pressure on the powers that be for a slice of the twenty-meter band just above the amateur allocation, you start to wonder what's going on, and why.

I am speaking, of course, about that ever-growing band of yachtsmen and women who are using amateur transceivers instead of (or with) their commercial gear. It has become so bad in the Pacific that they even have their own frequencies set up on twenty meters for rag-chewing, with some of them using false callsigns for contacts within the amateur bands.

It has come to the stage that the WIA and NZART have issued a joint statement, with the backing of both the Australian and New Zealand Government Communications Departments, condemning this practice.

There have been many times, of course, that amateur radio has come to the aid of yachtsmen in distress, and this may be one of the reasons why some are buying amateur gear as backup equipment for their boats. But if, as found just recently in Australia, they are buying amateur gear *instead* of the type of approved commercial gear that they should have on board, because it is cheaper, it is not only cents wise and dollar foolish but downright dangerous, as amateur gear is not designed for this type of operation—such as being caught in a howling gale and doing a couple of 360-degree loops with salt water flying everywhere. Commercial-type, approved yacht radios are built to stand this, but amateur gear is not; that is why the commercial marine radios cost more.

However, as with any occupation or endeavor, there is always the shady character out to make a fast dollar regardless of the risk to other people or the cost to the community.

One such unscrupulous dealer in New South Wales (VK2) found a good market in selling general-coverage transceivers designed for amateur use (but also converted to cover yachting frequencies) to some members of the yachting fraternity at a lot cheaper price, due to an import tax of only 2% on this type of general-coverage gear. This practice was soon noticed by a local manufacturer of radios designed for commercial application, and he complained to the Government, to protect his own business.

The reason amateur gear drew an import tariff of only 2% was that there was no manufacturer of amateur gear of this type in Australia, so it did not compete with local firms. In this case it did, and the result was that our government immediately put a 30% import duty on all amateur transceivers being imported into this country.

One sure way to get anybody to sit up and take notice is to hit him where it hurts, and with most people, including amateurs, that is in the hip pocket. Taking all the extras into account, the final price to the amateurs would have risen around 45% on all imported transceivers.

On July 6, 1983, the WIA, plus representatives of the major importers and distributors of amateur gear, a customs agent, and an editor of a local commercial amateur-radio publication held a meeting to seek facts and advice on how to handle this tariff rise. The WIA, after many submissions plus work on their members' behalf, came up with a solution agreeable to the government. The whole issue hinged on a tariff bylaw that contained the words "without substantial modification."

The submission to the government by the WIA was that they would set up a panel of paid members who have a radio engineer's background to type-approve amateur transceivers entering this country and issue compliance certificates, to enable retention of the 2% import tariff for amateur gear.

As you can imagine, this was no easy decision by the WIA, on behalf of its members, with a lot of on- and off-air discussions both for and against the WIA being involved in this type of endeavor. However, the WIA will remain impartial at all times regarding any decision made by this panel, and will not only accept but back its recommendations.

An excellent article by Bruce R. Bathols VK3UV, the Federal President of the WIA, in the February, 1984, *Amateur Radio* (the official publication of the WIA) gives the definition of what is required to cover the bylaw that states "without substantial modification," and explains how the WIA arrived at the criteria needed.

Excerpts:

1. We recognize that any piece of radio equipment can be made to operate on any frequency providing the person attempting the modification has the correct tools and equipment, and the knowledge of performing same. As a yardstick in this regard, we accept that an amateur of at least ten years' standing would have the necessary experience to analyze circuits and equipment, and perform an actual conversion.

2. Therefore, a "Difficulty Factor" can be determined in conversions. An experienced amateur, as noted above, would be expected to relate his efforts directly to the costs of the components required, time, and effort. A monetary figure would have to be placed on the time element, therefore commercial costs of repair rates and time would of necessity be applicable in this case.

3. As far as the WIA is concerned, our only requirement is to determine in the "Amateur Sense," what a substantial modification is. We are NOT concerned with commercial conversions or sales outside the Amateur Service. (We cannot stop them anyway.) A highly-experienced professional engineer would, no doubt, be able to convert any piece of equipment to be used on other bands in a very short time. As we are only responsible to the Amateur Service, only normal amateur-type methods will be used by our technical committee in determining a conversion difficulty factor.

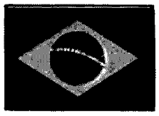
4. The objective, therefore, is to establish whether or not a conversion by an experienced radio amateur is able to be performed at a relatively cheaper cost than the payment of the actual tariff duty on the FOB cost of the equipment under consideration. A ratio between these costs can then be determined.

5. The ratio (a "Difficulty Factor ratio") will enable the WIA to decide whether or not a certain transceiver comes within the scope of the bylaw provisions. In this respect, only transceivers and transmitters designed for use by the Amateur Service and being imported by a recognized retailer or dealer of amateur equipment will be eligible for a WIA evaluation. Bona fide travellers bringing equipment into Australia purchased from overseas for their own personal use, will also be able to be included in the above.

It can be seen by the above just how much work, plus money, is involved by a national body representing its members in fighting repressive laws, whether they be added taxes, antenna-tower legislation, or loss of amateur frequencies. This is why it is imperative that those amateurs who sit on the sidelines as nonmembers of a united national amateur body representing ALL amateurs get their priorities right, or they could be paying an extra $800 for a FTI-type transceiver—as we nearly were. A small annual subscription is small price to pay to present a united front against anything detrimental to amateur radio.

How would it be if we all sat back and did nothing? I doubt if we would, with today's commercial pressure, have an amateur-radio service.

Adilson Ribeiro PY1AKM (left), Paulo Malavota PY1OZ (LABRE RJ Director), and Paulo Roberto Domingos PY1ZT.



BRAZIL

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Rua Afonso Pena 49, Apt. 701
20270 Rio de Janeiro, RJ
Brazil

RADIO AMATEURS OPERATING THE HALF MARATHON

For first time in Brazil (and we never heard about this anywhere else before) two radio amateurs joined the "Race of the Bridge" and put it on the amateur-radio air.

The Race of the Bridge is a yearly competition, a cross-country "half marathon," organized by the CORJA (Rio de Janeiro Runners Association) and sponsored by the Bradesco-Atlantica organization, a bank and insurance company helping amateur sports.

This 22,400-meter-long race (a "half marathon" as it's called here) crosses the longest concrete-built bridge in the world, The President Costa e Silva Bridge, 14 kilometers long, joining Niteroi City to Rio

de Janeiro City. It is 75 meters high at its highest point over wonderful Guanabara Bay, a dream scenery never to be forgotten.

Starting from the "Boat Station" in Niteroi and finishing at the Modern Art Museum, right in the heart of Rio de Janeiro City, this year's Race of The Bridge involved 2200 participants. There were 5 age categories: 15 to 19 years, 20 to 29, 30 to 39, 40 to 49, and 50 years on.

Two enthusiastic runners, Adilson Ribeiro PY1AKM and Paulo Roberto Domingos PY1ZT, brought the idea to our radio amateur league, LABRE RJ (Rio de Janeiro branch), and it had the immediate approval from Paulo Malavota PY1OZ, Sectional Director, so plans and action made it come true; equipment, land support, and instructions were settled on to do the best.

Running together, side by side, using a portable IC-2AT perfectly tested, with completely charged batteries, operating by turns, Adilson and Paulo Roberto carried out this so-successful operation, the first in Brazil!

Land-based station PY1AA (LABRE RJ official station) was responsible for all QSO appointments and QSL managing, runners Adilson and Paulo answering only to VHF contacts during the whole race.

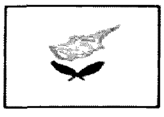
Promotion for the Race of The Bridge among radio amateurs, trying to have more of them at next year's race, and promotion for radio amateurism among the thousands of people accompanying the event, and through press and magazine publications, was the goal for this unusual initiative.

Of course runners could not worry about technical results, due to equipment care, lack of concentration at the race, and special attention to radio calls and to base-controller information, but final results were very interesting. LABRE's station PY1AA, under control of Maciel PY1ZH, joined HF calls to VHF, and many a long-distance QSO was a "WOW!" S. Paulo, Parana, and Minas States were contacted, and even an "Air Mobile" from a Boeing flying over Mato Grosso. The idea is very promising for years to come at the Races of The Bridge!

The race's scheduled time coincided with the "Patrulha Verde Amarelo" Net (Green and Yellow Patrol), a sweeping 40-meter net covering all Brazilian states, so some very interesting QSOs were realized, now and then, as PY1ZH joined 40 meters to VHF! As runners were using the PY1AA call, special interest was raised due to the possibility of QSO points for the PY1AA On-The-Air Award, sponsored by our LABRE RJ.

Well, we've read about races being described and accompanied by radio amateurs from the outside, but coming from the inside, from runners of the race themselves, it's really a first time! Special awards were presented to Paulo Roberto and Adilson—and they sure deserved it!

Adilson and Paulo Roberto near the finish line in Paris Square, Rio de Janeiro.



CYPRUS

Aris Kaponides 5B4JE
PO Box 1723
Limassol
Cyprus

NEWS FROM CYPRUS

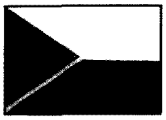
Summertime in Cyprus usually means, for local radio amateurs, fewer voices on the air. Most amateurs over here enjoy the sea or the mountains during their summer holidays and the HF rigs are set aside. However, the VHF rigs are used quite a lot from the holiday or portable locations. Most of the 2m contacts are between local hams, but some DX is also done with 4X- or OD-lands. During the first week of June, a lot of excitement was created by sporadic-E openings on 2m where a few 5B4 DXers made contact with HA-, YO-, and YU-lands. A few of the lucky ones who managed to work on sporadic-E were 5B4MC, 5B4LP, 5B4OK, 5B4MD, 5B4IT, 5B4IE, and 5B4JE.

Many interesting contacts can be made from central and western Cyprus with SVS- and SV9-lands and some of the Greek islands in the Aegean Sea. Fellows talking simplex on 2m with SVS and SV9 were 5B4JR, 5B4JX, 5B4JZ, and 5B4MG in Paphos (western Cyprus), and from the Nicosia area (central Cyprus) were 5B4OA, 5B4IE, 5B4MC, 5B4MD, 5B4LP, 5B4IT, and others.

A very interesting experiment was done successfully in Paphos by 5B4JX, who constructed a VOX system whereby he can connect the R3 repeater in Heraklion in Crete with R5 in Cyprus, or the R4 repeater in the Paphos area with R5, which is on the highest mountain peak in Cyprus. In this way, amateurs in Crete, Rhodes, Santorini, and other Greek islands in the Aegean can be linked with Cyprus. Also contacts were made with amateurs in Athens (via this system) who could open the R3 repeater in Crete. It is hoped that the system will operate on a permanent basis during the summertime. Many thanks to Sotos 5B4JX for this service on behalf of all amateurs in SV- and 5B4-land.

Recently an enthusiastic group of young men passed their radio-amateur examinations. Amongst those were some harmonics of well-known amateurs, such as the daughter of 5B4JX, YL Florentia, the son of 5B4EI, Iacovos, and my own son, George, age 16, who has the callsign 5B4OV. We are sure that all the newcomers will do well and we welcome them to the hobby.

In Cyprus there are five active club stations in Nicosia, Larnaca, Limassol, and Paphos. These are operated for 2 to 3 hours per week. From what I know, not many people are operating from there, but the club committees are trying their best to attract more young people to the club stations. An effort is made by CARS that this be a stage of practice and experience before the written radio-amateur examination. Our club stations are still very poorly equipped, and any help coming locally or from abroad will be appreciated. Please send all donations to Cyprus Amateur Radio Society, PO Box 1267, Limassol, Cyprus.



CZECHOSLOVAKIA

Rudolf Karaba (OK3KFO ARC)
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Czechoslovakia

SATELLITE RS6 (RADIO SOVIET 6)

Michal OK2BXF from Brno was interested in satellites already as OL6BDK. He established the first contact via the satellite RS6 on February 12, 1984, with the transistor output of 5 Watts (the transistor exciter 200 mW and a power amplifier with QQE 03/12) and with ground plane and HB9CV antennas. The receiver antenna is a dipole and it is on the receiver input KFW16A. With such a transmitter, QRP—5 Watts ERP, he established even 5 contacts during the one orbit.

According to OK3AU, there are further new stations on the RS satellite carriers. These are the stations OK3LW and OK3WAO from the region of East Slovakia.

WINNERS FROM 1983 OK DX CONTEST

Top five stations worldwide and points earned:

Single/Multiband	
LZ2PP	209664
UA1DZ	176630
UQ2GDQ	167258
OK2FD	120175
OK3ZWA	118545
Single—1.8 MHz	
DL1YD	6084
LZ2BE	3700
UA3PFN	2079
UP2BLF	2016
Y39XO	1986
Single—3.5 MHz	
HA8BY	8664
HA6NL	8525
Y51XE	7098
UA3QBP	6655
UB5INO	6000
Single—7 MHz	
LZ2SC	20010
LZ1GC	18336
LZ1SS	14950
LZ2RS	13608
OK2BFN	11544
Single—14 MHz	
UA9YAN	28105
HA0MM	23920
UH8EAA	22152
I2VXJ	20490
UA3TDK	19136
Single—21 MHz	
UA0SAU	14478
UA3AMB	11136
UA9MAF	10935
UW3UO	10500
OK2BEW	10430
Single—28 MHz	
RA9AKM	2940
UG6GAF	2310
HA4XX	2268
RA9UAD	2072
RA9SUV	1872
Multi-Op/Multiband	
LZ2KZA	185760
LZ1KOZ	178067
UK2BBK	162486
OK1KRG	157080
HA5KDQ	145636

GREAT BRITAIN

Jeff Maynard G4EJA
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Windes WA8 9RP
Cheshire
England

I was pleased to note that the recent D-Day Anniversary celebrations included a tribute to the role of the amateur in providing operating skills and development expertise in the field of radio during World War II. As you no doubt saw in the television coverage of the event, the beaches were visited by The Queen and Prince Philip.

The latter is the patron of the RSGB and was the recipient of a message of greeting originated by a D-Day special-event station, GB4DD, at the London Air Traffic Control Center, RAF, West Drayton, and sent to a French special station, FV6PAX. The received message, asking the Prince to convey greetings from all radio amateurs to the assembled Heads of State, was handed by FV6PAX to the Mayor for onward transmission to the Royal party.

Sometime later, GB4DD received a message, again via FV6PAX, from The Queen expressing thanks for the original message and wishing all the best to all radio amateurs in the nations involved. Needless to say, everyone concerned with GB4DD was delighted at the receipt of the message.

PRACTICAL WIRELESS

I will now digress somewhat from the general type of news and information that makes up the bulk of this column. This is because I have just come into possession

of three books recently published in the UK of which two are directly related to amateur radio and the third of which will be useful in most shacks. All three books are reprints of a number of articles originally published in *Practical Wireless*, the monthly UK publication dealing with all aspects of radio (and not necessarily of direct interest to active hams). The three books are titled *Wires and Waves*, *Introducing RTTY*, and *Are the Voltages Correct*?

Wires and Waves is subtitled "a guide to antennas, accessories, and propagation" and contains no less than 42 articles in 160 pages. The topics covered range from theory through antenna construction to swr bridge and other accessory construction. This is mostly a practical book, with the theory section limited to only five subjects, of which one is yagi design principles, anyway. The practical coverage of the book is aimed at the transmitting and receiving amateur alike and concentrates on the constructional aspects of low-cost antennas for HF and VHF bands. Most of the designs use readily-available and cheap materials.

Most of the antennas for construction seem to be based on much practical experience and not just theory. For example, a 2-meter beam is described for construction from a broom handle, car brake pipe, and aluminum tubing. In similar vein is the construction of a pseudo beam antenna suitable for installation on the balcony of a high-rise apartment block and based on two mobile whip antennas and an ingenious phasing arrangement.

Accessories described, in addition to the swr bridge already mentioned, include an ATU, an audible field strength meter, and a couple of preamps together with some notes on interference, suppression, and filtering. I found the low-pass SW-listener filter particularly useful and easy to reproduce.

Each constructional article includes a full list of components together with a cost estimate (in pounds sterling, but you would, no doubt, find it indicative) and a construction rating. This latter guide is Beginner, Intermediate, or Experienced. It's always nice to have an indication of cost and complexity before embarking on a project.

Wires and Waves is similar to but complementary to *The ARRL Antenna Anthology*.

I must confess an interest before describing *Introducing RTTY* because it is based largely on a series of articles of the same name which I wrote a year or two back and which were serialized in *Practical Wireless*. In addition to my articles introducing RTTY are some software and a number of equipment reviews.

My original aim was to explain the background of RTTY and follow that with a collection of modules that the reader could assemble in any suitable configuration he wished to form the basis of his RTTY station. RTTY is a form of data transmission based on Mr. Baudot's 5-unit code transmitted at 45.45 baud (60 wpm). The initial article illustrates the development of RTTY signals (from terrestrial TTY) and shows how FSK and AFSK signals are produced with modern transceivers.

Rather than describe a complete terminal unit (TU), the remaining sections describe a variety of circuit building blocks which may be put together as desired. These include, for example, interfaces between TTL and ±12 volts and single-and double-current 80 volts, filters, tone generators (including a crystal-controlled version), and various demodulators.

Using these building blocks, the reader can put together a basic TU for reception only or reception and transmission depending on his requirements. Having whetted his appetite, a more sophisticated TU will no doubt follow (personally I now use Dovetron, which is first class but expensive).

The third of the *Practical Wireless* books is subtitled "a guide to fault-finding with your multimeter" and provides 44 pages of detailed theory and practice regarding circuit-voltage measurements. Basic principles are explained from simple voltage dividers through the effects of meter resistance to the influence of inductance and capacitance in ac circuits.

The real benefit of the book, though, comes with the sections on applying a multimeter to fault-finding in real circuits. As, for example, a number of popular radio circuits are discussed with the voltages one can expect in both working and failed equipment.

The three books are obtainable directly from the publishers: IPC Magazines Ltd., Westover House, West Quay Road, Poole, Dorset BH15 1JG, England. Prices (including airmail postage) are: *Wires and Waves*—\$6.22; *Introducing RTTY*—\$2.13; and *Are the Voltages Correct?*—\$3.05.

Airmail subscriptions to *Practical Wireless* magazine are \$40.00 per annum (12 issues). All conversions are at \$1.40 to each pound sterling.

Once again I must say that although I love to hear from readers, please *do not* write to me about these books. I have no easy means of shipping them, so please contact the publishers directly.

ISRAEL

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Kibbutz Urim
Negev Mobile Post Office 85530
Israel

PROPAGATION

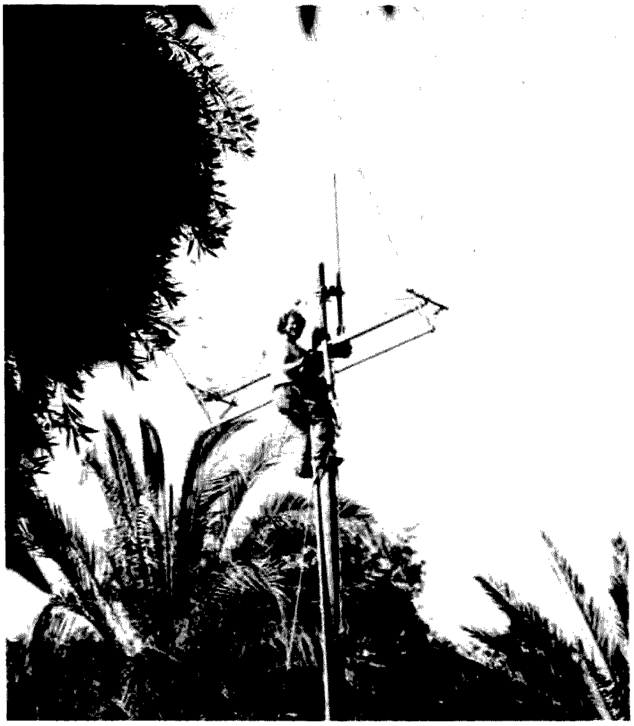
As these lines are being written, the long hot summer is upon us. VHF conditions vary from good to excellent with the typical eastern Mediterranean tropospheric ducting facilitating daily two-meter contacts between Israel and Cyprus and sometimes the Greek islands. On HF, ten meters is all but dead, but twenty meters is the star with the band wide open to North America during the late night plus long-path propagation to Australia/New Zealand in the early morning. Fifteen meters often comes alive at night with openings to North and South America, although generally to certain areas alone and not wide-open conditions.

MOUNT CARMEL RTTY REPEATER

The newest addition to the chain of repeaters in Israel, W4FQM/4X RPT, was activated in the spring. Located on Mt. Carmel overlooking the Mediterranean Sea from a height of 350 meters, this repeater is a unique phenomenon in our region presenting the amateurs with almost endless possibilities for use. It was built, shipped over, set up, and donated to the Israel Amateur Radio Club by Ed Webb W4FQM. It is a near duplicate of a machine built and operated by Ed in Florida, and the hams here are just beginning to discover its various uses.

The input frequency is 144.700, the coding frequency for radioteletype in IARU Region One. The output frequency is 145.300, making the repeater compatible with standard two-meter gear using a 600-kHz split. Mark frequency is 2125 Hz and space is 2295 Hz. To activate the repeater, you must frequency-modulate your signal with the mark frequency for two seconds, and the repeater will open, leaving a tail of 15 seconds at the end of each transmission. Should the repeater fall, you reactivate it with the mark frequency.

In the RTTY mode, the machine does not operate as a typical FM repeater. Rather, it digitally encodes the signal received and reconstitutes it with a vastly-improved signal-to-noise ratio. Thus, a RTTY signal under the noise and not clear to the human ear is turned into a clean, readable signal making possible solid long-range contacts where all else might fail.



Ron Gang 4Z4MK.

Technically speaking, the heart of the repeater is a 20-Watt Hamtronics unit with a 70-Watt amplifier, with a Wacom duplexer consisting of four cavities ahead of the antenna. At the time of writing, the repeater also functions on standard FM, although a transmission of the mark frequency will shift it over to the RTTY exclusive mode, so that the machine may be used on voice on a secondary basis. From my QTH, 200 km south of Mt. Carmel, I have succeeded under ducting conditions to make contact through the machine using an indoor hand-held rig with its rubber-duckie antenna. This testifies for the superb sensitivity of this repeater!

Lately, Israel 4X4UF has begun transmitting a nightly bulletin at 10:00 pm local time, on RTTY, of course. The bulletin is a summary of the weekly *HaGal on the Air*, IARC news magazine, edited by 4Z4RM and 4X4UF. It consists of local and international amateur news, buyers' and sellers' announcements, technical news, etc. The bulletin is updated every Wednesday, and Israel will transmit it at other times upon request.

Reportedly, Ed W4FQM is building a mailbox for the storage and retrieval of messages on the repeater. With the proliferation of home computers and amateurs using them to get on radioteletype, interest is running high. We are all grateful to Ed for his gift, and without doubt it has already made a great contribution to the technical advancement of Israeli amateurs. Amateurs in the Mediterranean basin are invited to try to work through the repeater, and it will be interesting to see what kind of DX will be possible.

OSCAR NEWS

Ya'ir 4X4GI reports that at this time there are five Israeli stations making contact through the OSCAR 10 satellite: 4X4FQ, 4X4GI, 4X4IX, 4X4MH, and 4Z4AG. Ya'ir has contacted stations in Hawaii, New Hebrides, and other "rare" islands in the Pacific through the bird, accomplishments normally quite difficult from here on the HF bands.

Steve 4X6MF, who by the time you are reading this should be active on the satellite along with the other new Israeli stations, is beginning to organize a local chapter of AMSAT. Reports are that there are more satellites in the offing, and with the decreasing sunspots and poorer HF conditions, interest is mounting in the country in satellite communications.

INTERFERENCE ON TWO METERS

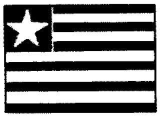
It is a well-known fact that the two-meter transceivers manufactured for amateurs sell for a fraction of the price of sets produced for the commercial two-way radio market. For this reason, many clandestine organizations around the world use amateur gear for their nefarious purposes, and certain dealers are more than happy at this opportunity to turn a profit, no questions asked.

For many years, until the PLO terrorists were expelled from Southern Lebanon in June, 1982, two meters in Northern Israel especially was plagued by interference from these quasi-military groups. Especially hard hit was the Haifa repeater, with its input frequency of 145.000 MHz apparently being a calling frequency for these outfits. As a result, a tone access was added to the repeater to prevent its being triggered by non-amateur signals. This feature was deleted after the 1982 war silenced the source of this QRM.

Two-meter non-amateur activity is

again on the rise in Lebanon by the various organizations operating there. Now with the summer upon us and long-range tropospheric propagation present, these stations are being heard all across the two-meter band. This time, strangely enough, the main victims are the repeaters in Cyprus, especially on R2 and R5. At some times of the day, say our Cypriot counterparts, these repeaters become virtually unusable because of the clandestine operations on their input frequencies.

This time, no immediate solution is in sight. This curiosity is simply one of the by-products of political instablity in our area, and we'll have to learn to live with it.



LIBERIA

Brother Donard Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
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Monrovia
Republic of Liberia

CB NO PROBLEM IN LIBERIA

Our amateurs are aware of the evils associated with CB radio and are determined that it will not get out of hand here. It is legal, but at the present time a CB license is very difficult to obtain. There are those who want to get on the air without doing all the work of learning the code or of passing theory tests. They are working at it here as they are in the US and other places. To date they are losing the battle.

In the commercial broadcast band there is a lot of empty space. We have only three stations. One is really commercial and the other two are mission stations which are commercially licensed but which exist primarily to bring the good news of the gospel to the people they can reach. With all this empty airspace, the Liberia Radio Amateur Association has the bright idea of obtaining a spot on which to broadcast code much as is done by W1AW. It is not practical to do that on the amateur bands because so many of the people for whom this service is intended do not have and will not easily get an amateur radio. The Association has been working on this idea for more than a year. Things move slowly in Liberia.

In Holland, there is a great problem of unlicensed broadcasting to and for the general public on the regular commercial bands. The problem is completely out of control, much as is CB in the States. Some of our outlying mission stations are looking at that situation with interest. In one case it has gone beyond the looking stage and there is a five- or ten-Watt stereo station in operation. Everyone is happy. The station operates three or four hours a day with music and news reports and is the only thing that is available to that community. This little station, though not formally licensed, operates with the knowledge and consent of the Ministry of Telecommunications.

Another mission station is considering the possibility of a like operation. This is very interesting, and from where we sit it seems that there is nothing to lose and everything to gain. Certainly the people in those outlying communities appreciate what is being done. It is a credit to the Ministry that they do make an exception in this instance, and so long as these little outpost stations operate with proper authorization, there is little likelihood that things will get out of control.

That is a little aside. The immediate problem is that everyone wants to take a shortcut into the world of amateur radio. "No-code licensing," CB space in the amateur bands, just anything to get in without doing the work. Over and over again we find that the results are counter-productive. Japan has no-code licensing. For an evaluation of the result read *73*, August, 1983, page 73. The amateurs must be alert and they must make every effort to preserve the great hobby that is theirs. In the States they have won another round, and that is all that it is—another round. See *73*, March, 1984, page 104. When the amateurs give in or simply lose the fight, amateur radio as we know it will just fade away.

In Liberia, the Radio Amateur Association works very closely with the Ministry of Post and Telecommunications, which is the department of government under whose jurisdiction amateur radio operates. The Ministry scans the amateur bands and checks for violators. The amateurs themselves do the same in a somewhat less organized but nonetheless effective way.

Amateurs in Liberia do follow the rules and they take pride in maintaining a high standard of courtesy and technical efficiency. The same can be said of most of the amateurs of the world, but not all. I, as an outsider living in Liberia, am impressed. I think it is a great credit to this little country, and as amateurs around the world make their contacts with Liberia, they will meet with courtesy and respect.

MONTSERRAT

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Plymouth
Montserrat
British West Indies

SCANNING FROM MARS

Well it's the official Annual Hurricane Season once more in the Caribbean area. This comes into effect on June 1st each year, and with 22 hurricane names listed for this season, it's small wonder that amateur-radio operators throughout the region are keeping a watchful eye on weather conditions as a measure of disaster preparedness.

The island of Montserrat, a British colony located in the eastern Caribbean about 268 miles southeast of Puerto Rico and only 39-1/2 miles square, has just held a three-day Disaster Preparedness and Emergency Management Workshop. This was jointly sponsored by the Pan-Caribbean Disaster Preparedness and Prevention Project Committee (PCDPPP) and the government of Montserrat, which was designed to correlate plans and actions to be taken by the various groups and organizations that are usually involved in the education and protection of the general public in times of national emergencies and disasters.

This workshop was held at the Government Training Center located in Plymouth, the capital, beginning on Wednesday, June 20, and ending on Friday, June 22. Lecturers were Mr. Jerome Lloyd—Consultant, PCDPPP, Dr. Deryck W. Heinemann—Project Manager, PCDPPP, Lt. Col. Glenn A. Mignon—Disaster Preparedness Advisor (UNDRO), PCDPPP Course Director, and Miss Elizabeth Twinch—British Red Cross Advisor, PCDPPP.

The workshop was attended by senior officials of the Executive Committee (Disaster), officials of government, statutory boards and companies, and voluntary organizations, also district and deputy chairmen. Some of the topics discussed at the workshop were:

- Preparing the community for disasters
- Role of the security forces in a disaster
- Role of the Red Cross during these times
- Role of communications, with a presentation given by the president of the Montserrat Amateur Radio Society, and role of the media
- Role and functions of the disaster management organizations
- Managing mass casualties

Many other aspects of disaster and emergency preparedness were covered, all of which incorporated the use of radio communications for efficiency because of the terrain of the island. Thus the Montserrat Amateur Radio Society plays a vital role as the organization most readily equipped to provide this service.

As previously stated (see *73*, May, 1984), the Montserrat Amateur Radio Society has a team of operators assigned the task of manning various police stations, the airport, the hospital, and the local government public broadcasting station (ZJB), thereby providing a continuous link with the Central Control which is located within the confines of the Plymouth Police Headquarters.

In addition to these stations, which will be operating via the 2-meter repeater (but with capabilities of reliable simplex operation), there are at least two additional stations delegated to operate on the HF bands with the objective of maintaining contact with the outside world in the event that all other means of communications become unavailable.

These stations are readily equipped with standby generators, batteries, dipoles, and verticals should the main antennas be lost in the expected gale-force winds usual with hurricanes. These are the stations of Dr. Konrad Hollatz VP2MF and VP2MO; the latter will be operated by Mae Martin VP2MN. Both these stations were very active during the 1979 Dominica crisis caused by Hurricane David and provided the necessary information to one of our local radio stations (Radio Antilles, a 200,000-Watt system that covers the entire Caribbean Area and beyond) and the Government Broadcast Station which covers the neighboring islands.

At this time, as has been the practice of the past years, all members of the Montserrat Amateur Radio Society's Disaster Team are maintaining a close link with each other just in case...

On the HF band, the designated standby, weather watch, and coordinating frequencies for the Caribbean area are the same as those of the Antilles Emergency and Weather Net. These frequencies are 3.815 MHz in the evenings and mornings and 7.168 MHz during the day.

This net operates twice daily, 365 days a year at 1030Z and 2230Z, normally on 3.815 MHz, and reverts to the 40-meter band only for exercises or in times of disasters. During normal nonemergency times, the net operates as follows.

Two islands are responsible to provide NCOs on a weekly rotational basis, one island doing the morning session and the other the evening session. There is a roll call for island-by-island check-ins, beginning with Venezuela in the far south to Jamaica and beyond in the north.

Weather information is provided from the Netheriand Antilles, Trinidad and Tobago, Barbados, the French Antilles, Antigua and Barbuda, and The US Virgin Islands, obtained from their respective net offices, thus providing a concise weather picture throughout the Caribbean area.

The Montserrat Amateur Radio Society recently met for its annual general meeting, during which the following officers were elected for a term of one year. President: Errol "Bobbie" Martin VP2MO, Vice-president: Sydney St. C. Meade VP2MC, Secretary/Treasurer: Mrs. Ursula Sadler VP2MDY, Equipment Officer: Victor James VP2MQ, Activities Manager: Tony Glaser VP2MIX, and Executive Member-at-Large: Dr. Vernon Buffonge VP2MV.

The following persons have been reappointed to these respective positions: Awards Manager: Errol "Bobbie" Martin VP2MO, and QSL Manager: Mr. Gene Ege, Sr. WB2LCH.

Please note that Gene WB2LCH is QSL Manager for these stations on Montserrat *only*: VP2M (Special Events Station), VP2MN (Joanna "Mae" Martin), VP2MO (Errol "Bobbie" Martin), and VP2MLD (Lawton Daley). All other QSL cards should be sent to their respective owners and *not* to WB2LCH.

QSL PROBLEMS

One of the major problems that the Society (*and* VP2MO) is faced with is that of being used as a QSL Bureau, and as such we are being clobbered with cards from all over the globe. The strangest part of it is the fact that cards are coming here for countries as far away as J20 and the rest of the Caribbean area.

Please be informed that no QSL Bureau exists on Montserrat, for we are not equipped to handle this service—neither financially or otherwise. This matter is ofttimes discussed at our club meetings, and the only persons being catered to by the Society are its members and others who have made the proper arrangements with the Society. Please also note that the more active *resident operators* here each have a QSL Manager, and anyone needing a response should utilize the managers' services as much as possible, unless the operator states otherwise. This method would make things much better for all concerned.

Guest operators usually give their respective QSL route, and one has only to listen. Another situation which exists and needs to be rectified is the direct QSLer. These fall into three basic categories: (1) An enclosed SAE with return postage, (2) An enclosed SAE with no enclosed postage (sometimes no enclosed envelope), and (3) a QSL card, stamped, mailed with a request *PSE QSL TNX*.

My response to these types are as follows:

The first person does the proper thing, for even if the enclosed postage is inadequate, he deserves an immediate response with a card via first-class mail.

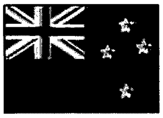
The second type of person has got to realize that the DX station must have worked many stations, thus if he were to send a card to everyone without the necessary postage, he would not be able to stay on the air for very long, and even were he to be able to respond to 50%, who would deserve to be that lucky half?

Regarding type 3, I think that anyone who would pay (?) to have his cards printed and then just throw them into the mails caring nothing about defacing his callsign and any other info that was so carefully put together doesn't deserve one of mine, for to me a QSL card represents something, so I think that that kind of person has no respect for his card, his call, nor the operator at the other end, for why do they make envelopes anyway? Proud of your call? Proud of your card? Then prove it!

Until we meet again, my fellow hams

out there, it's always very pleasant to meet operators (VP2MO) saying catch me on RTTY daily from about 1700Z on or near 14.084 MHz, and if you're lucky you might even run into Joe VP2MJL or Tony VP2MIX, and very soon, too, "Doc" VP2MF.

73 and gud DX as I'll be scanning from MARS.



NEW ZEALAND

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New Zealand

This month I shall give readers a couple of examples of the close liaison between the ZL regulatory body, the New Zealand Post Office, and NZART, our amateur-radio national association.

In 1982, the NZPO decided to conduct a review of the Amateur Service as a whole in view of changes it had observed in other countries and because of submissions from NZART. The last major change to the Amateur Service was in the mid-60s when the Grade III Technician class was introduced. Since that date only minor changes have been introduced with the introduction of the New Zealand Radio Regulations 1970 (an update on the previous radio regulations).

Accordingly, NZART was invited to put forward submissions for a review of the Amateur Service as a whole which could be considered in conjunction with changes the Post Office itself saw as being advantageous. Generally, the proposals submitted had to conform with the conditions laid down by the International Radio Regulations.

In response to the invitation, our association, after several top-level discussions, submitted a 37-page document, and some discussion on the proposals took place between the Post Office and a team of NZART council members.

The Post Office then drew up a paper on the outline of a proposed structure for the Amateur Service in ZL, which included a number of proposals from remits placed before the Post Office by NZART from annual conferences over a period of time. This "paper" was then distributed to all ZL licensed amateur operators, who were given the opportunity to comment on the proposals before the regulations were amended or changed to give effect to any or all of proposed changes. At the same time, the Post Office asked all amateurs for suggestions other than those put forward in the paper, provided such suggestions conformed with the general parameters for the Amateur Service as laid down in the International Radio Regulations.

It is the intent of the Post Office that, within those constraints, the conditions under which the Amateur Service in New Zealand operates reflect the wishes of the majority of the users. It is interesting to note here that the submissions were made by NZART on behalf of its members as the "voice" for the Amateur Service in ZL, but the Post Office saw fit to circularize ALL amateurs and allow them to individually suggest changes, thus providing for the 27% of licensed amateurs who are not association members to be heard on this important subject.

A summary of the proposals follows; readers are reminded that the changes are only suggested at this stage, but as they are the result of joint consultation, it is probable the final draft will be very similar to the following.

Qualifications: 3 levels of qualified operators: Novice, Non-Morse, and General. (The titles are merely descriptive at this stage.)

Entry may be made at any one of the levels, and the Novice grade will be non-terminating. It will be possible to hold both the Novice grade and Non-Morse grade of qualification simultaneously.

The Non-Morse grade is unchanged from the present Grade III, and the General grade will replace the existing Grade II and Grade I certificates.

Examinations: Examinations will be held twice yearly and will consist of a written examination in two parts, a technical paper and a regulations and procedures paper. (Basically the same as at present.) The Morse test will remain an essential part of the Novice and General qualification examinations, the scope of the test being widened to include a knowledge of figures and common punctuation marks. It will be possible to obtain a partial pass, but credits for part passes will remain valid only for two further scheduled examination dates.

Privileges: The General qualification will attract the privileges currently granted to the holders of Grade I certificates, e.g., all bands, all modes. The Non-Morse qualification will have the same privileges as are currently available to Grade III certificate holders, e.g., 27.12 MHz, 51-53 MHz, and all bands above 144 MHz.

The Novice qualification will be non-terminating, i.e., it may be held indefinitely without a need to upgrade, and will carry the following special conditions and frequencies: Power restricted to 10 Watts dc input to the final rf stage, and operations restricted to CW and AM (including SSB) in the bands 3525-3575 kHz and 21100-21200 kHz.

Log keeping: Consideration will be given to waive the requirement that amateur operators keep a station log in accordance with regulation 53. However, amateurs will be encouraged to keep a log, recognizing that the document plays an important part in some amateur activities.

These proposals were sent to all amateurs in ZL in April this year, and we had until May 31st to forward our submissions to the Post Office. On that date, several hundred amateurs had taken the opportunity to reply to the Post Office on the paper, and to this date there have not been many objections to the document, in the main. We now await the decision of our regulatory body with interest.

The second example of cooperation and liaison resulted from two remits passed at our recent annual conference in early June this year. In just under one month from the date of the passing of the resolutions, the Post Office implemented both proposals. They concern visiting amateurs and our Grade III certificate holders.

The ZLØ visitors' call holders will not have to suffix their ZLØ call with their home callsign as was required previously; now visiting hams will not have such an awful mouthful to say when working on the bands here in ZL, they will merely use their allotted ZLØ callsign. The other remit requested the Post Office to permit Grade III operators to use CW on their allotted frequencies. Previously, Grade III could not use the CW mode but were permitted to use all other modes.

BITS 'N' PIECES

Silent Keys recorded recently were D. (Dan) McMahon, ex ZL1CM, aged 88 years, a respected, retired Auckland Radio Inspector and long-time amateur and marine operator; and M. H. (Mark) Churton ZL1TB, another old-timer and well-respected amateur operator well-known to many overseas hams.

Old-Timers Club 50-year certificates were recently presented to R. A. (Ray) Anderson ZL3JV and T. E. (Tom) Rowlands ZL3JX, and 60-year certificates went to T. R. (Tom) Clarkson ZL2AZ, ex ZL2AR and ZL1FO, and H. N. (Nev) Shrimpton ZL2AUM, ex ZL4AO and ZL2BJ. Congratulations to these operators for their long and active career in amateur radio.

Over recent columns I have been reporting on ZL offshore islands and their respective amateur activities. This month I shall briefly tell you about another ZL offshore island, but unfortunately the amateur activity would not have been of any use to overseas amateurs as the operator was confined to VHF activities.

Snares Islands, a small group of uninhabited islands 209 km southwest of Bluff (the southernmost port of ZL) at 48°S 166°36'E, were discovered independently on the same day, November 23, 1791, by Vancouver in the *Discovery*, and Broughton in the *Chatham*. The group covers an area of approximately 350 hectares and consists of coarse granite with a covering of peaty soil. The soil is densely vegetated, mainly by tupari (Olearia iyallii), which creates an almost closed canopy to 6 meters high.

The Snares Islands are administered as a nature reserve under the Reserves Act by the Lands and Survey Dept., and entry is by permit only. This is due to the absence of introduced mammals and virtually unchanged vegetation and animal life. Their pristine state gives these islands world recognition as important sanctuaries.

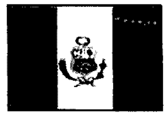
During the three-month period December, 1983, to February, 1984, P. J. Wilson ZL3TJD/A, ZL9TJD operated an amateur station on VHF from Snares Island. He operated on 2 and 6m with an Icom 260A into a 10-element yagi, and an Icom 505 into a 5-element yagi. Both rigs were powered by gel batteries, charged using a Honda generator.

Contacts on 6 during the three-month period included VKs 1, 2, 3, 5, and 7, and ZLs 1, 2, and 3, and ZL7OY; Chathams was heard, but unfortunately not worked; 2m contacts through repeaters at Invercargill and Queenstown were made as were five simplex contacts with ZL4 stations from the high part of the island, Signpost Hill, 82m above sea level.

The trip to Snares Islands was made by a University of Canterbury field party, ZL3TJD being employed as a technician to assist with the penguin census and banding, as well as with some entomological collecting. The visit was made possible through a research grant provided by the Lands and Survey Department. (Information for this item was supplied through the courtesy of *Break-In*, the NZART monthly official journal.)

The 24-GHz record for ZLs was broken on April 7, 1984, when Tony ZL1BHX and Russell ZL1BQK extended the communication distance to 33 km, in the Ninety Mile Beach area in the North Auckland area. They used 25-mW Gunplexers™ into 17-dB gain horns and 30-MHz homebrew (DJ7OO-designed) i-fs. Their report states the first contact was from Ahipara Lookout to Hakatere Forestry Observation Post. Then once they had established contact, Tony ZL1BHX moved up the beach, but after the distance was extended further, the salt-spray haze increased and copy was in and out quite rapidly, so they decided to quit while still ahead of the old record.

A "contest with a difference" is held annually in ZL that always causes a lot of laughs—it is the QLF activity, this year held on Wednesday, August 15, 0800Z to 1000Z. Its main object was to have a packet of fun on 80 meters. The rules are very simple, the execution a little difficult for some. The mode is CW, a straight hand key must be used, and operators use the hand not normally used, e.g., right-handed ops use their left hand and vice versa. If by chance you're ambidextrous, you must operate the key with your foot. Scoring is one point for each contact, with a bonus of one extra point for each contact where either operator is using "foot keying." In the case where both operators use foot keying, they score three points each for the contact. There's no prize, but the contestants submit their own score sheets and a winner is declared for this fun activity.



PERU

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Caracas 1061-A
Venezuela

I have resided in Venezuela since 1973 and have written several columns here about that country, but as a Peruvian I miss the flag of my own country in "*73 International*" and that's the reason I'm now at my computer, writing about amateur radio in Peru. I hope that somebody down there in OA-land feels motivated to become a correspondent for "*73 International*."

I wish you readers to know that I have little material since I left my country 11 years ago, and certainly many things must be quite different. I have tried to get some news but really have not received much. In fact, it is very difficult to receive support from readers and from radio clubs, no matter their whereabouts. People like to see their names printed and club members are delighted to see their clubs' activities published, but when you try to get information for publishing everybody says "I'll call you . . . !" Actually, nobody calls you back. The same with requesting pictures or any printed material.

Peru, the land of the Incas, is located in South America facing the Pacific Ocean, between Ecuador and Chile. The territory has four natural regions: the Coast, the Sierra (Andes), the Selva (jungle), and the fourth, which is the territorial sea that extends 200 miles from the coast. The Coasta is almost only a strip of sandy land (almost never rains) but it has 23 valleys, one for each river, where most coastal cities are located.

The Sierra is all the central region crossed by the Andes from north to south. In this territory is located the highest railroad and one of the highest cities of the world. Here also is located the highest lake in the world (Titicaca) and also the third highest mountain in the Americas.

Peru, for communications purposes, is divided in 9 zones (call areas) as shown on the map. I remember that the OAØ prefix was for maritime mobiles, but now the *Radio Amateur Callbook* lists several Peruvian warships with the OA4 prefix and the designation, Radio Club Naval BAP (ship name). I don't know the reason for this. There are no inhabited islands in the Peruvian sea, except those with navy installations. Thus I assume that the OAØ prefix should still be devoted to maritime mobiles.

Radio-amateur licenses are of three

Continued on page 104

John S. Wilcox KS4B
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Leonardtown MD 20650

A Tree-Mendous Vertical

Build an 80m DX-getter that really grows on you.

Eighty meters is a fun band. Something for everyone is the byword. From the diverse nets entangling the top end, through the casual groups and rag-chews in the spectrum, to the well-populated CW band, you are challenged not to find an entertaining operation. DX, especially in the winter months, is surprisingly good. With the sunspot cycle approaching its minimum, we'll see it get even better.

For you uninitiated, tune through the 3790–3800-kHz DX window some evening from sunset until a few hours after. For the most part, I guarantee you'll hear stateside stations working DX. What I can't guarantee, with your 30-foot-high loaded dipole or ground-mounted trap vertical working against 3 radials, is whether you'll hear the DX stations.

80 meters is no different in its antenna requirements than the other HF bands. A dipole or inverted-V hung a half-wave above ground is a good performer, as is a quarter-wave vertical working against a good ground system. The only problem is that a half-wave at 3.8 MHz is over 120 feet. The opportunity to construct such antennas eludes most of us because of space restrictions or lack of green stamps to buy and plant large support structures. A forty-foot-high inverted-V might bag WAS on the 3787-kHz GERATOL net during a winter season, but it lacks the zing needed for DX competitiveness.

All is not lost! Described here is a low-angle radiator that anyone with a 40-foot-high tree in the vicinity of the ham shack can construct and use to gain that competitiveness on 80 meters.

Design of this antenna is an adaptation of the folded umbrella described by John Haerle WB5IIR.[1] I suggest you obtain John's article for further information on this superior design. Construction is simple, straightforward, and noncritical. No ground radials, base insulators, loading coils, or high-cost items are required. Approximately 100 feet of small nylon line, some assorted TV hardware, a few ground rods, and four 90-foot lengths of any wire are all that's required. I recommend no. 14 insulated house wire, but I've used no. 17 galvanized-steel electric-fence wire in one installation.

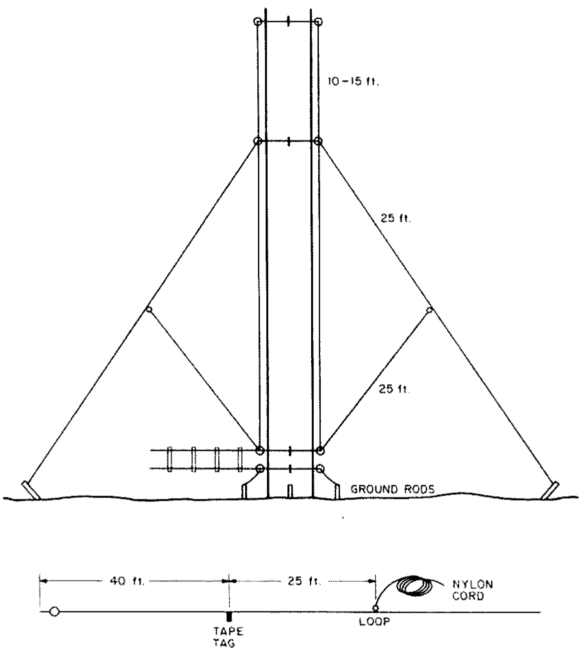

Fig. 1.

Observing Fig. 1, you can see the idea is to cage the tree with wire. I use 4 wires, but I have the feeling more vertical wires along the trunk would be an improvement. Sure, I know. Everyone says trees are great rf absorbers, but I'll say this antenna plays as well as John's folded umbrella in my backyard.

Attach four TV-standoff eyes at equal spacing around the base of the tree about a foot off the ground. Form a loop of wire through the eyes. Hammer in ground stakes by each eye and connect wire to the stake and loop by soldering or using small Servit™ connectors. This completes the ground system! A few radials will help if you have the room but are not necessary.

Place four more eyes into the tree an inch or two above the ground-ring eyes. Form a wire loop through these eyes. Roughly measure 90 feet of wire and attach an end to one of the eyes. Measure 40 feet from the eye and tag the wire with some tape. Measure 25 more feet and twist a loop

in the wire. Attach about 30 feet of nylon cord to the loop. This is shown in Fig. 1. Now climb the tree with the loose end of the wire, making sure it lays close along the trunk. When you reach the tag height, screw in four more eyes. Again, form a loop of wire through them. Thread the loose end of the wire through one eye and throw the remaining wire and nylon cord out through the branches. A weight will help. Bring up three more wires using the respective eyes. I did these one at a time to keep them from tangling. The branches of my oak tree were enough to contend with!

At the top standoff eyes, attach a 10- to 15-foot wire to each. Either continue up the tree with them to another eye and wire-loop arrangement, or if you've run out of tree, lay them out on limbs to form a semblance of a top hat.

When you're back on the ground, pull the four loose wire ends in to the tree trunk and connect them to their respective eyes as shown in Fig. 1. All connections should be soldered or connected with Servits.

Open-wire feed from an unbalanced matchbox will net you all bands from 160 through 10 meters. If you desire coax feed, you might have to adjust the top-hat length to resonate the antenna to your preferred 80-meter frequency, although you'll find it's quite broadbanded.

Now try 3790–3800 kHz some evening and enjoy *working* DX. I know it doesn't outperform W1CF's phased array, but then I haven't wired the other three trees! ■

Reference

1. John M. Haerle WB5IIR, "Folded Umbrella Antenna," *Ham Radio*, May, 1979.

Bob Eldridge VE7BS
Erickson Road
Pemberton BC V0N 2L0
Canada

When Darkness Calls

On 160m, success means diligent planning. These tips on gray-line propagation are your key to Top-Band DXCC.

Anyone who works Top Band knows that strange and wonderful things happen around sunset and sunrise (twilight at your end of the QSO, at the other end, or at both). There are some interesting reasons for this, and if you have a better understanding of what causes the DX to emerge at these special times, you have a head start in the drive for WAC or DXCC 160.

"Sunrise" in this context may last quite a while, from sometime before the sun actually appears until sometime after it has cleared the horizon. The duration of the effect depends on the latitude of the location and the time of year. For example, in midwinter at the equator the time window is very narrow, about ±5 minutes; at 50° about ±45 minutes; at 60° about ±90 minutes. If you have watched the sun rise in the tropics, you will have noticed that it rises almost due east and zooms straight up into the sky very quickly. In polar regions it creeps out of the SSE horizon and travels almost horizontally, so it is not easy to decide just when it has actually arrived.

Finding the Times of Sunrise and Sunset

There is no problem in knowing when to expect your own sunrise and sunset, but how can you find the times for a particular DX location? Here are some of the ways:

1) The "DX Edge" is a slide-rule-type operating aid made especially for this purpose and has information on zones, prefixes, etc., as well. It is simple to use and is available for $14.95 postpaid from: The DX Edge, PO Box 384, Madison Square Station, New York NY 10159.

$$\text{Sunrise} = \frac{\text{longitude W}}{15} + \frac{\cos^{-1}(\tan a \times \tan \text{latitude N})}{15}$$

$$\text{Sunset} = \frac{\text{longitude W}}{15} - \frac{\cos^{-1}(\tan a \times \tan \text{latitude N})}{15}$$

Fig. 1. Formulas to calculate sunrise and sunset in decimal UTC where "a" is the inclination of Earth's axis with respect to the direction of the sun at that particular time of year.

2) If you have a calculator which handles trigonometric functions (and you know how to use it), the times can be calculated using the formulas in Fig. 1. To use these formulas you have to know the inclination of Earth's axis with respect to the direction of the sun at that particular time of year. John Devoldere ON4UN has a table showing this in his book, *80-Meter DXing*, and can also supply a computer printout of times by prefix. An inclination table can also be found in K6UA's "Gray Line" article in CQ, September, 1975, p. 30.

3) If you have a Commodore computer, you can buy a collection of programs (which includes an excellent sunrise/sunset program by David Williams) for only $10.00 from Public Domain, 5025 Rangeline Road, West Milton OH 45383. If you own a Commodore 64, ask for Collection #4 and you'll get 37 other programs as well for your ten bucks—can't beat 25¢ a program! You enter the latitude and longitude of the location and the date; if you wish, it will automatically convert to UTC (GMT for the old-fashioned or Zulu for some). The computer also asks for the angle of the sun over the horizon. I enter 0°. The author of the program put in −.75° as "a widely-used figure." It makes only a few minutes difference in the calculation, but if anyone out there in *73*-land knows what this is all about, write a letter to *73* and let the rest of us know.

4) Finally, you can use Fig. 2, which is taken from a *CCIR Report* and is good for anywhere in the world at any time of the year. The time scale is in local standard time, so use the longitude of the station concerned to convert to Universal Time.

On the month axis, estimate the position of the specific day on the scale. This is very important in spring and fall; for example, you will see from the chart that at 50°S on the 1st of February, sunrise is about 4:40, but by the end of the month it is 5:25.

The Gray Line

The great circle line around Earth dividing the dark side and the sunlit side of the planet is called the "terminator." It is not a very

sharp division except near the equator, and radio amateurs call it the gray line, a descriptor brought into radio terminology by K6UA.

On the daylight side of Earth, the D-layer of the ionosphere is heavily ionized and absorbs most of the 160- and 80-meter signals, preventing them from reaching the reflecting layers above. At night the D-layer has decayed and these signals can easily go through to the upper layers and be reflected down to more distant locations.

At the terminator, a special condition exists. Fig. 3 shows the conditions in the ionosphere which help the DXer at the eastern end of the darkness path at sunrise (European working into W, or W working into JA, for example).

Ionization builds up first in the upper layers, and in fact, never entirely disappears from them in the middle of the night. At twilight the D-layer is only partially ionized: too little to absorb the 160-meter signal, and too much to allow the signal to pass straight through to the upper layer and be reflected down to medium distances (as it does during the night).

The partial ionization causes the signal to be *refracted* (bent) in the D-layer, and it may travel hundreds or thousands of miles within the layer before going on its way to the upper layer. Not only does it go further before hitting that layer, but it also arrives at a narrower angle, making for both better reflection and a longer hop.

You can see that for a station right near the terminator, an antenna with a high-angle vertical takeoff lobe may sometimes reach out further than one with an antenna which concentrates the signal closer to the horizon, but the low-angle antenna will stay in contact for a longer period after sunrise.

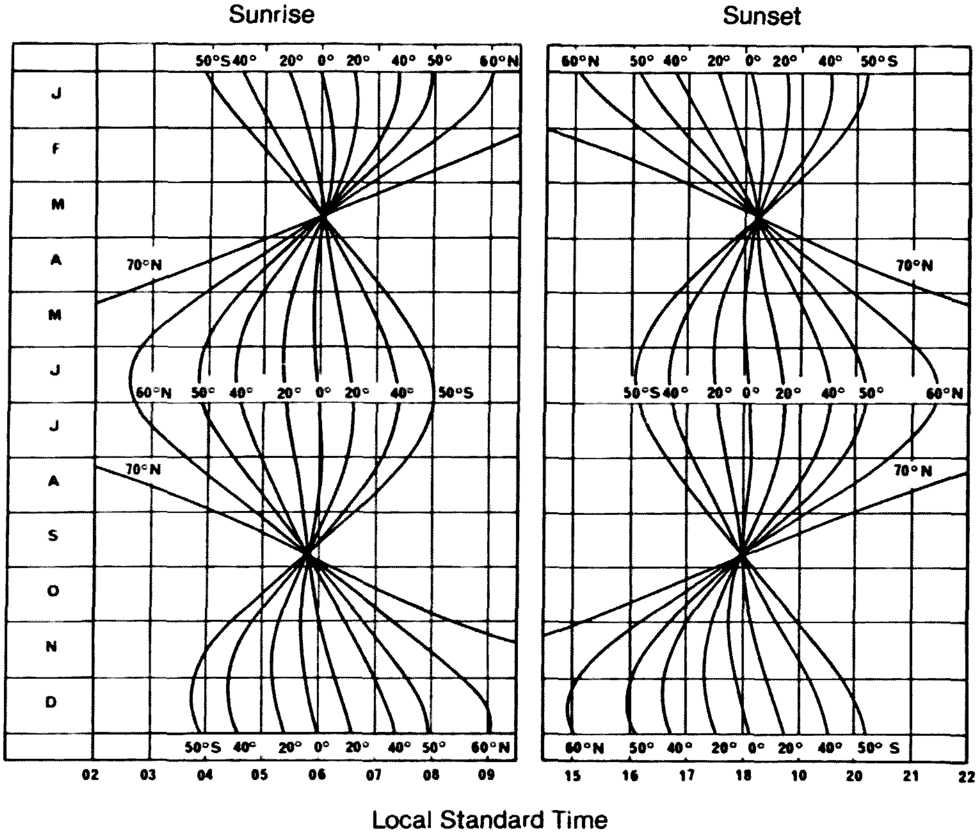

Fig. 2. Times of sunrise and sunset anywhere in the world (in local standard time).

There is another phenomenon which helps the Top Bander at sunrise. On the dark side of Earth, the F-layer is higher than it is on the sunlit side. At the terminator, where the transition from one height to the other occurs, the layer is *tilted* and signals reflected from it come down at a more useful angle for DX working. Fig. 3 illustrates this effect, which was explained in 1979 by Hortenbach and Rogler.[3]

So what do we do about it?

- At *your* sunrise, look for signals from the west of you.
- At your sunset, look for signals from the south and southeast (along the terminator) and then from the east.
- If you are in darkness, look for signals from the east at the distant station's *sunrise* or before it.
- If both you and the distant station are on the edge of the darkness path, there is an especially good chance of propagation between you. ■

References

1. John Devoldere ON4UN, *80-Meter DXing*, Communications Technology, Greenville NH 03048.
2. K6UA, W6NLZ, and K6SSS, "The Gray Line Method of DXing," *CQ*, September, 1975.
3. K. J. Hortenbach and F. Rogler, "On the propagation of shortwaves over very long distances . . .", *Telecommunication Journal*, June, 1979.

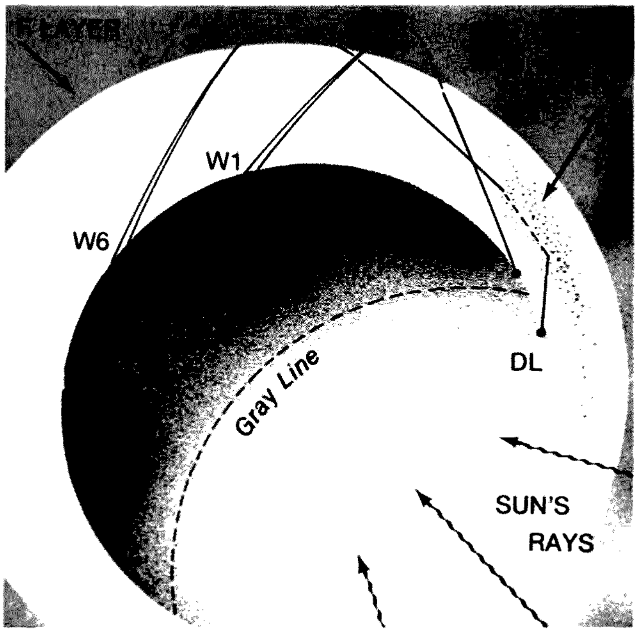

Fig. 3. Sunrise in Europe.

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SCIENCE SOFTWARE for VIC-20 and PC-2. Radio astronomy, moonbounce, amateur satellites, etc. David Eagle, 7952 W. Quarto Dr., Littleton CO 80123; (303)-972-4020. BNB153

FREE CATALOG—computer supplies. Control Data SS/DD, $21; DS/DD, $31. Dysan SS/DD, $30; DS/DD, $40. Ribbons: MX80, $7.50; MX100, $14; Okidata 82-92, $2.50; Okidata 84, $5.00; Diablo Hytype II m/s, $4.40; Diablo Hytype II nylon, $4.80; NEC Spinwriter m/s, $4.75; 6-outlet surge and spike power strip, $49.95. Shipping, $3.00. Mastercard/Visa—include number and expiration data. OUTPRINT, 44 Forrest Road, Randolph NJ 07869. BNB159

SWL REPORT FORMS designed for maximum information at your listening post. Give real meaning to your DX reports. Details 2 IRCs. Rout. 3/137 Champion St., Christchurch, New Zealand. BNB180

DIGITAL AUTOMATIC DISPLAYS for FT-101s, TS-520s, Collins, Drake, Swan, Heath, and others. Six 1/2" digits. Write for information. Grand Systems Dept. A, PO Box 3377, Blaine WA 98230; (604)-530-4551. BNB183

VIC-20/C-64 budget-priced interface/software for full CW rcv/xmt. Features LED tuning, programmable message buffers, large type-ahead buffer, and more. Works with any rig. Specify computer and disk or cassette: $39.50. Paul Rosenkranz N5FQN, Route 4, Box 24D, Taylor TX 76574. BNB191

ANTENNAS WANTED: We pay cash for surplus amateur and CB antennas. Must be in original boxes and in reasonably good condition. Send a list or call: H. C. Van Valzah Co., 1140 Hickory Trail, Downers Grove IL 60515. BNB195

NEW HAM-SWL SOCIETY for unity of thought & learning. Open to all. Many topics, awards, free ad space in periodical, society net, museum participation. Shack pics & QSLs welcome. Writers needed. SASE for info to RCSW, 32 Applegate, Bennington VT 05201. BNB197

KT5S SUPER DX SLOPER 80-10m only $59.95. KT5B multiband dipole 160-10m only $59.95. 2-kW roller inductor (28 uH) $47.50. Weather-boot kit (PL-259) $8.95 p.p. Much more! Info available. Kilo-Tec, PO Box 1001, Oak View CA 93022; (805)-646-9645. BNB198

YOU (CAN BE) VERSUS CRIME. Security alarm systems easily learned. Employment-business terrific. Age no barrier. Get in now. Don't delay. Information package $2.00. Security Electronics International, PO Box 1456-RK, Grand Rapids MI 49501. BNB203

WANTED—MILITARY SURPLUS RADIOS. We need Collins 548L-4, 548U-1, 548T-V, 426U-2, UHF719A, 618T, ARC-94, ARC-102, RT-712/ARC-105, ARC-114, ARC-115, ARC-116, RT-823/ARC-131 or FM622, Wilcox 807A or RT-857/ARC-134, ARC-159, RT1167 or RT-1168/ARC-164, ARC-174, RT-1299/ARC-186, APX-76, APN-171, MRC-98, 718F-1/2, HF-105. Collins antenna couplers 490T-1, 490T-2, 490T-9, CU-1658A/ARC, CU-1669/GRC, CU-1402/ARC, 490B-1, CU-1239/ARC-105. Top dollar paid or trade for new amateur gear. Write or phone Bill Slep, Slep Electronics Company, Highway 441, Otto NC 28763; (704)-524-7519. BNB204

COMMODORE 64 CW INSTRUCTOR PROGRAM. Generates CW on TV speaker. Random code, keyboard input, or prerecorded CW tests. Character speed and spacing set independently. Designed for classes and increasing code speed. $15.00—diskette or cassette (specify). Dennis Olver N7BCU, 22000 S. Tonya Ct., Oregon City OR 97045. BNB205

FOR SALE: LNW System Expansion 2 $250, Holmes Sprinter $45, Langley amber CRT $50, TEK-535A manual $30, mint 51J4 $200, TEK-585A on cart w/manual & 3 plug-in units $425, 4-1000A used/tested $50. Russell L. Lawson, 124 South Grand St., West Suffield CT 06093; (203)-668-2871. BNB206

CHESS PLAYERS—Radio-chess schedules, matches, tournaments. Details: K2VJ, Box 882, Cologne NJ 08213. BNB207

COMMODORE 64 OWNERS: Now a custom CW cartridge with your name and call. Send and receive up to 30 wpm with split-screen display. Complete with instructions and schematics for home-brew interface only $39.95. Custom CW 2.0 from ALC Electronics, 718 W. Coral Ave., Ridgecrest CA 93555; (619)-375-7203. BNB208

TWO-METER QUAD—two-element plastic construction. Assembly required. $21.50 + $4.00 s&h. Michigan residents add .86 state tax. Mercury Products, Box 598, Saugatuck MI 49453. BNB209

EIMAC 8874s—New, late manufacture, $160. W9ZR, (414)-434-2938. BNB210

SES receivers & downconv. w/instr., capable of receiving between 2 GHz & 4 GHz, tunable audio, as is: $100.00/set. Call VI, (818)-765-2422. BNB211

2000+ new component parts: capacitors, resistors, diodes, transformers, etc. $1,200 or best offer. Call VI, (818)-765-2422. BNB212

CX7 REPAIRS. Mark Mandelkern, 2315 Derby St., Berkeley CA 94705; (415)-549-9210. BNB213

SCHEMATICS: Radio receivers 1920s/60s. Send name, brand, model no., SASE Scaramella, PO Box 1, Woonsocket RI 02895-0001. BNB214

BACK ISSUES OF 73: January 1969 through February 1982 complete except for March 1980. Prefer pickup or you pay shipping. 13 years of articles! $130.00. Steve Goldstein, 99 Charles St., Reading MA 01867; (617)-944-7102 eves before 11 EDT. BNB215

ENGINEERING SOFTWARE—Free flyer and money back guarantee. CP/M, MSDOS, TRSDOS. PLOTPRO—graph printing program. Linear/logarithmic, multiple plots, grid lines, labeling, $52.95. ACNAP—analyzes active/passive electronic circuits. Monte Carlo, worst-case, sensitivities, $52.95. SPP—signal processing, FFT, linear/nonlinear, LaPlace, transient analysis, more, $62.95. BV Engineering, 2200 Business Way, Suite 207, Riverside CA 92501; (714)-781-0252. BNB216

MAKE PRINTED CIRCUITS BOARDS without messy chemicals. Complete instructions, $2.00 postpaid. Kenneth Hand WB2EUF, PO Box 708, East Hampton NY 11937. BNB217

QSLS & RUBBER STAMPS. Top quality. QSL samples and stamp information 50¢. Ebbert Graphics D-7, Box 70, Westerville OH 43081. BNB218

HAM RADIO REPAIR, tube through solid state. Robert Hall Electronics, PO Box 8363, San Francisco CA 94128; (408)-729-8200. BNB219

HAM TRADER YELLOW SHEETS, in our 23rd year. Buy, swap, sell ham-radio gear. Published twice a month. Ads quickly circulate—no long wait for results. SASE for sample copy. $9 for one year (24 issues). POB 356, Wheaton IL 60189. BNB220

DX HEADING MAPS for Boston, NYC, Phila., Baltimore, Detroit, Atlanta, Chicago, New Orleans, Saint Louis, Dallas, LA. 11 × 17 $1.75 pp. 22 × 34 $5.95 pp. Specify city. Bill Massey W2HOJ, PO Box 397, Hainesport NJ 08036. BNB221

HAM HELP

I need someone to adjust a Mite teletypewriter. I will pay all repair costs and shipping.

Harold Parks WB2BNH
24 Caryl Avenue 6-C
Yonkers NY 10705
(914)-963-0689

Telegraph or wireless key, made in South America for use in South America, wanted for a private collection.

Dick Randall K6ARE
1263 Lakehurst Rd.
Livermore CA 94550

I need help locating design data and wiring information for wiring power transformers.

Howard Mullen N7FOA
166 E St. SE
Ephrata WA 98823

I need schematic diagrams and alignment instructions for Hallicrafters SX117 and HT44. I will pay copying cost and postage or copy and return.

William Hartley K2RDS
1201 Paul Ave.
Schenectady NY 12306

SOCIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

OTTAWA ONT CAN
OCT 5-7

The Ottawa Amateur Radio Club will host the 16th annual Radio Society of Ontario Convention on October 5-7, 1984, at the new Westin Hotel in Ottawa. Registration is $8.00, the non-amateur program is $4.50, the Friday-night eyeball and dance is $6.00, and the Saturday banquet and dance (14-piece orchestra) is $27.00. Other features include forums, papers, commercial displays all day Saturday, and a Sunday-morning program. Talk-in on 146.34/.94. For more information, contact RSO Convention Committee, PO Box 15806, Station "F", Ottawa, Ont., Canada K2C 3S7.

WARRINGTON PA
OCT 6-7

The Pack Rats (Mt. Airy VHF ARC) cordially invite all amateurs and their friends to the 8th annual Mid-Atlantic VHF Conference which will be held on Saturday, October 6, 1984, from 9:00 am to 5:00 pm, at the Warrington Motor Lodge, Route 611, Warrington PA, and to their 13th Pack Rat Hamarama on Sunday, October 7, 1984, from 7:00 am to 4:00 pm, rain or shine, at the Bucks County Drive-In Theater, Route 611, Warrington PA. The conference will feature an all-day VHF program, a cocktail hour and get-together at 6:30 pm, and a buffet dinner ($13.00 each) at 7:30 pm. Conference registration is $4.00 in advance (before September 23rd), $5.00 at the door, and includes admission to the Hamarama. Admission to the Hamarama flea market on Sunday is $3.00 and selling spaces are $5.00 each. The gate will open at 6:00 am for sellers (bring your own tables). Food and drink will be available. Talk-in on 146.52 MHz (W3CCX). For more information, contact Hamarama '84, Post Office Box 311, Southampton PA 18966, or phone Lee A. Cohen K3MXM at (215)-635-4942.

DEERFIELD NH
OCT 6

The Hosstraders' Fall Tailgate Swapfest will be held on Saturday, October 6, 1984, sunrise to sunset, at the fairgrounds, Deerfield NH. Admission is $2.00, which includes tailgaters. For a nominal fee, camping will be available after 4:00 pm on Friday (no reserved spaces). Profits benefit the Shriners' Burn Institute and last spring's donation was $5,813. For a map or more information, send an SASE to Joe Demaso K1RQG, Star Route, Box 56, Bucksport ME 04416.

HAMILTON ONT CAN
OCT 6

The Hamilton Amateur Radio Club, Inc., will hold its 2nd annual flea market on Saturday, October 6, 1984, beginning at 8:30 am, at Marritt Hall, Ancaster Fairgrounds, 625 Highway 53 East. Admission is $2.00. Flea-market vendors' 8-foot tables are $4.00 plus admission and commercial vendors' 8-foot tables are $10.00 with admission included. There will be room for 150 vendors and setup will be from 7:00 am to 8:30 am. Coffee, soft drinks, and sandwiches will be available. Talk-in on 146.16/146.76 (VE3NCF). For space reservations, contact HARC Flea-Market Committee, PO Box 253, Hamilton, Ont., Canada L8N 3C8. For more information, contact Stan VE3GFE on VE3NCF.

BALTIMORE MD
OCT 7

The Columbia Amateur Radio Association will hold its 8th annual hamfest on Sunday, October 7, 1984, from 8:00 am to 3:30 pm, at the Howard County Fairgrounds (15 miles west of Baltimore, just off I-70 on Route 144, 1 mile west of Route 32). Admission is $3.00 and XYLs and children will be admitted free. Tables are $6.00 additional if paid by September 30th and $8.00 additional after that date. Outdoor tailgating is $3.00 additional and indoor tailgating is $6.00 additional. Food will be available. Talk-in on 147.735/.135 and 146.52/.52. For table reservations and more information, write Mike Vore W3CCV, 9098 Lambskin Lane, Columbia MD 21045, or phone (301)-992-4953.

ROME GA
OCT 7

The Rome Hamfest will be held on Sunday, October 7, 1984, beginning at 8:00 am, at the Civic Center in Rome GA. Talk-in on 147.90/.30. For more information, phone T. J. Freeman at (404)-232-2830.

BENTON HARBOR MI
OCT 7

The Blossomland Amateur Radio Association will hold its 1984 Blossomland Blast on Sunday, October 7, 1984, from 8:00 am to 3:00 pm EDT, at the Lake Michigan College Community Center, I-94 Exit 30, just west of Benton Harbor MI. Admission is $3.00 per person and tables are $5.00 each. Special features will include an Air Force MARS display, a Skywarn training program, and a radio-controlled airplane display. Talk-in on .22/.82 and .52 simplex. For more information, contact BARA, PO Box 175, St. Joseph MI 49085, or phone Paul WD8MWT at (616)-983-1710.

SANTA FE NM
OCT 7

The Northern New Mexico Hamfest will be held on October 7, 1984, from 8:00 am

to 3:00 pm, at the Terrero Group Shelter, along the Pecos River, east of Santa Fe. Admission is $3.00 for adults and $1.50 for children. Activities will include a tailgate flea market, group meetings, family games, fishing, and picnicking. There will be hot dogs, chips, soft drinks, and coffee available, as well as free Saturday-night camping. Talk-in on local repeaters and .52 simplex. For further information please send an SASE to Northern New Mexico ARC, c/o Bob Norton N5EPA, Route 3, Box 95-15, Santa Fe NM 87501, or call on 3.939 MHz at 0100 UTC.

YONKERS NY
OCT 7

The Yonkers Amateur Radio Club will sponsor the Yonkers Electronics Fair and Giant Flea Market on Sunday, October 7, 1984, from 9:00 am to 4:00 pm, rain or shine, at the Yonkers Municipal Parking Garage, corner of Nepperhan Avenue and New Main Street, Yonkers NY. Admission is $2.00 each and children under 12 will be admitted free. Gates will be open to sellers at 8:00 am and there will be a $6.00 admission per parking space which will also admit one (bring your own tables). Refreshments, free parking, and sanitary facilities will be available, as well as unlimited free coffee. There will be live demonstrations all day and a giant auction at 2:00 pm. Talk-in on 146.265T/146.865R or .52 direct. For more information, write YARC, 53 Hayward Street, Yonkers NY 10704, or phone (914)-969-1053.

SOUTH SIOUX CITY NE
OCT 12-13

The 3900 Club and the Siouxland Amateur Radio Repeater Association will sponsor the 8th annual 3900 Club Hamboree and Iowa State Convention on October 12-13, 1984, all indoors at the Marina Inn, South Sioux City NE. Admission to the flea market and convention is $6.00 each. Tickets for the Saturday-night banquet (featuring speaker Dr. Beverly Mead of Creighton University) are $10.00 in advance and $12.00 at the door. Other activities will include exhibitions, ladies' programs, forums (QRP, Air Force MARS, QCWA, UHF/VHF, ARRL, DX session, Novice session, and a 0 QSL bureau), and a Friday-night get-together. Talk-in on 146.37/146.97. For advance flea-market reservations, write Al Smith, 3529 Douglas, Sioux City IA, and for other reservations, write Dick Pitner, 2931 Pierce, Sioux City IA.

SYRACUSE NY
OCT 13

The Radio Amateurs of Greater Syracuse 1984 Hamfest will he held on Saturday, October 13, 1984, beginning at 9:00 am, at the Art and Home Center Building, New York State Fairgrounds, Syracuse NY (adjacent to Interstate 690, just 3 miles southeast of the NYS Thruway, Exit 39, and one mile northwest of Syracuse and Route 81). The hamfest will have complete indoor facilities and, weather permitting, there will be an outdoor flea market in the front courtyard. Volunteer exams will be given for Novice, Technician, and General classes. Breakfast and lunch service will be available. Commercial exhibitors may begin their setup on Friday from 7:30 pm to 10:00 pm and on Saturday from 7:00 am to 9:00 am.

MEMPHIS TN
OCT 13-14

The Mid-South Amateur Radio Association, the Delta Radio Club, and the Memphis Radio Relay Club will hold the annual Memphis Hamfest on October 13-14, 1984, in the air-conditioned Pipkin Building at the Memphis Fairgrounds. The hours on Saturday are 8:00 am to 4:00 pm and on Sunday, 9:00 am to 2:00 pm. All activities will he held inside and will include forums, ladies' programs, and a large flea market. Dealers' booths are $60.00 each for the weekend and flea-market tables are $5.00 each per day (there are two drive-in doors for unloading). Trailer hookups are available. For special rates at nearby hotels or for more information, write Clayton Elam K4FZJ, 28 N. Cooper, Memphis TN 38104, or phone (901)-274-4418 days, or (901)-743-6714 evenings.

FALLS CHURCH VA
OCT 13-14

The National Capitol DX Association will sponsor ARRL-approved DXPO '84 on October 13-14, 1984, beginning at 1:00 pm on Saturday and ending at 1:00 pm on Sunday, at the Best Western Falls Church Inn, 6633 Arlington Boulevard (Route 50), Falls Church VA. A broad variety of DX subjects will be included in the program. A banquet with speaker Father Moran 9N1MM will be held Saturday evening. For further details, contact Stuart Meyer W2GHK, DXPO Chairman, 2417 Newton Street, Vienna VA 22180, or phone (703)-525-6286 (office) or (703)-281-3806 (home).

LIMA OH
OCT 14

The Lima Hamfest will be held on October 14, 1984, at the Allen Country Fairgrounds, at the intersection of I-75 and Routes 309 and 117, Lima OH. Tickets are $3.00 in advance and $3.50 at the door; full tables are $6.00 and half tables are $3.50. For more information, tickets, or tables, send an SASE to K8TCF, c/o NOARC, Box 211, Lima OH 45802.

PARAMUS NJ
OCT 14

The Bergen ARA will hold a Ham Swap 'n' Sell on October 14, 1984, from 8:00 am to 4:00 pm, at Bergen Community College, 400 Paramus Road, Paramus NJ. There will be tailgating only; bring your own table. Admission for sellers is $4.00; buyers will be admitted free. Thousands of spaces will be available. Talk-in on .79/.19 and .52. For more information, write Jim Greer KK2U, 444 Berkshire Road, Ridgewood NJ 07450, or phone (201)-445-2855, evenings only.

WAUKESHA WI
OCT 14

The Kettle Moraine Radio Amateur Club will hold its annual Ham, Computer, Video Fest on Sunday, October 14, 1984, at the Waukesha County Expo Center, Highways F and FT, Waukesha WI. Tickets are $2.50 in advance and $3.00 at the door. Tables are $3.00 for each 4-foot length and reservations will be accepted until September 24th. Since all facilities will be indoors, the hamfest will be open rain or shine, beginning at 8:00 am. There will be food available and commercial exhibitors. For reservations, send a check (payable) to KMRA Club, PO Box 411, Waukesha WI 53187.

DOVER MA
OCT 20

The Middlesex Amateur Radio Club will hold its annual Amateur Flea Market on October 20, 1984, from 9:00 am to 3:00 pm, at Dover Town Hall, Dover MA. Admission is $1.00 and tables are $8.00 each. Refreshments and ample free parking will be available. For further information, send an SASE to Irv Geller KO1N, 1450 Worcester Road, #422A, Framingham MA 01701.

CIRCLEVILLE PA
OCT 20

The Irwin Area ARA will sponsor a Swap and Shop on Saturday, October 20, 1984, at the Circleville VFD, just off Rt. 30, 3.5 miles west of the Pennsylvania Turnpike, Exit 7. Talk-in on .325/.925 and .52. For further information, write Don Myslewski K3CHD, 359 McMahon Road, North Huntingdon PA 15642, or phone (412)-683-0570.

TAMPA FL
OCT 20

The Hillsborough Amateur Radio Society (HARS) will hold its annual one-day Amateur Radio and Computer Hamfest on Saturday, October 20, 1984, from 8:00 am to 8:00 pm, at the Ft. Hesterly Armory, corner of Cass and Howard Streets, Tampa FL (just south of I-275 exit for Howard and Armenia). Donations are $3.00 in advance and $4.00 at the door. Swap-table donations are $7.00 and commercial booths are $30.00 (advance registration is requested). Talk-in on 147.075. For advance tickets, booths, and tables, write Conrad Kibler WB4ARS, 10102 Cliff Circle, Tampa FL 33612, or HARS, PO Box 24602, Tampa FL 33623, or call Ralph Larkin AA4PM at (813)-884-4126.

GRAY TN
OCT 20

The fourth annual Tri-Cities Hamfest will be held on Saturday, October 20, 1984, at the Appalachian Fairgrounds, located five miles south of I-81 on Highway 23, Gray TN. Registration fee is $2.00. Features include a flea market, forums, and dealers. RV hookups will be available. Talk-in on 146.37/.97 and 147.87/.27. For further information, write Tri-Cities Hamfest, PO Box 3648 CRS, Johnson City TN 37601.

CHICAGO IL
OCT 21

The 3rd annual CCRL Hamfest will be held on Sunday, October 21, 1984, from 7:00 am to 2:00 pm, at American Legion Post #21, 6040 N. Clark Street, Chicago IL 60660. Admission is $1.00 in advance and $1.50 at the door. Tables are $2.00 each. Talk-in on 145.030 simplex. For more information, write Norman Geuder KA9EZA, 6345 N. Magnolia, Apt. I-1, Chicago IL 60660, John Ibes KA9FUI, 2934 N. Mobile, Chicago IL 60634, or Frank Bonnell WB9OHN, 1674 W. Hollywood, Chicago IL 60660.

CHATTANOOGA TN
OCT 27-28

Hamfest Chattanooga and the Tennessee State ARRL Convention will be held on October 27-28, 1984, at a new location, Memorial Auditorium, Oak Street, Chattanooga TN. Inside space will be available for dealers and flea-market vendors and 8-foot tables will rent for $6.00 per day or $10.00 for both days. There will be new, used, and peripheral equipment, computers, hardware and software, and genuine junk in 27,000 square feet of indoor space. Activities will include forums, contests, and non-ham programs. Amateur exams (Novice through Extra) will be given on Saturday in the West Assembly Room of the Memorial Auditorium at 8:00 am. Please send a completed 610 form with a copy of your license and a check or money order for $4.00 payable to WCARS/VEC by October 15, 1984, to: Hamfest Chattanooga, PO Box 22161, Chattanooga TN 37422. For more information, write Hamfest Chattanooga, PO Box 3377, Chattanooga TN 37404, or phone Nita Morgan N4DON at (404)-820-2065.

MARION OH
OCT 28

The Marion Amateur Radio Club will hold its 10th annual Heart of Ohio Ham Fiesta on Sunday, October 28, 1984, from 0800 to 1600, at the Marion County Fairgrounds Coliseum. Tickets are $3.00 in advance and $4.00 at the door; tables are $5.00. Food and plenty of parking will be available. Talk-in on 146.52 and 147.90/.30. For more information, tickets, or tables, contact Paul Kilzer W8GAX, 393 Pole Lane Road, Marion OH 43302.

KALAMAZOO MI
OCT 28

The 2nd annual hamfest/electronic flea market will be held on October 28, 1984, from 9:00 am to 4:00 pm, at the Kalamazoo County Fairgrounds, Kalamazoo MI. Admission is $2.00 in advance and $2.50 at the door. Four-foot table spaces and table rentals are $2.50 in advance and $3.00 at the door (spaces with power must be reserved and paid for in advance). There are 400 spaces available and dealer setup is at 8:30 am. For more information, contact Ham 10 FM Club of Kazoo, Ken Losey KA8RUA, 2825 Lake Street, Kalamazoo MI 49001.

FRAMINGHAM MA
OCT 28

The Framingham Amateur Radio Association, Inc., will hold its annual fall flea market on Sunday, October 28, 1984, beginning at 10:00 am, in the Framingham Civic League Building, 214 Concord Street (Rte. 126), downtown Framingham. Admission is $2.00 and tables are $10.00 (preregistration is required). Seller setups begin at 8:30 am. Radio and computer gear will be featured and food will be available. Talk-in on .75/.15 and .52. For more information, contact Jon Weiner K1VVC, 52 Overlook Drive, Framingham MA 01701, or phone (617)-877-7166.

ALBUQUERQUE NM
NOV 3

The UNM ARC and the Westside ARC will jointly sponsor a tailgate swapfest on November 3, 1984, from 10:00 am to 2:00 pm MST, on the UNM North Campus parking lot, corner of University Boulevard and Tucker Avenue, Albuquerque NM. Admission is free; bring your own tables as none will be furnished. Talk-in on 147.75/147.15 MHz and 449.3/444.3 repeaters. For further information, send an SASE to Gary Bonebrake K8BI, 974 Arkansas SE, Rio Rancho NM 87124, Robert Scupp WB5YYX, 648 Marquis Drive NE, Albuquerque NM 87123, or Jay Miller WA5WHN, 4613 Jupiter NW, Albuquerque NM 87107, or via 3.939 MHz, 0100 UTC daily.

WEST MONROE LA
NOV 10

The Twin City Hams will sponsor an all-indoor hamfest on Saturday, November 10, 1984, from 9:00 am to 3:00 pm, at the Convention Center, N. 7th Street, West Monroe LA. Features will include exams, swap tables, new-equipment dealers, and a ladies' program. Talk-in on 146.25/.85. For more information, contact Benson Scott AE5V, 107 Contempo, West Monroe LA 71291.

NEWMARKET ONT CAN
NOV 10

The York Region ARC will present the 8th annual Newmarket Flea Market on Saturday, November 10, 1984, beginning at 0800, at the Newmarket Community

Center, Civic Drive, Newmarket (just north of Toronto). Admission is $2.00 per person and children under 12 will be admitted free. Table rentals are $3.00 each plus general admission and will be held only until 0800 unless payment is made in advance (setup is at 0630). Refreshments will be available. For table reservations (include a check or money order made out to the York Region ARC) or more information, contact Geoffrey Smith VE3KCE, 7 Johnson Road, Aurora, Ont., Canada L4G 2A3, or phone (416)-727-6672 (evenings).

NORTH HAVEN CT
NOV 11

The Southcentral Connecticut Amateur Radio Association (SCARA) will hold its 5th annual Electronics Show and Flea Market on Sunday, November 11, 1984, from 9:00 am to 3:00 pm, at the North Haven Recreation Center, Linsley Street, North Haven CT. Admission is $1.50 and children under 12 accompanied by an adult will be admitted free. Tables are $10.00 in advance for the main hall and $12.00 at the door. (Reservations are strongly advised.) Setup will be at 8:00 am, and for new equipment vendors, a special exhibit area with setup security arrangements will be made available. There will be food both at the food booth and from a mobile cart. Features will include the latest in ham radio, computers, and electronics. Talk-in on 146.01/146.61 (W1GB). For more information, directions, and reservations (make checks payable to SCARA), send an SASE to Tony Vanacore AK1O, PO Box 81, North Haven CT 06473, or phone (203)-484-4175 (home) or (203)-239-5321, extension 311 (days).

PENANG, MALAYSIA
NOV 16-18

The Malaysian Amateur Radio Transmitters Society (MARTS) will host the 14th SEANET Convention on Friday, Saturday, and Sunday, November 16-18, 1984, at the Eastern and Oriental Hotel, Penang, Malaysia. Features will include symposiums, luncheons, tours, and rag-chewing. For more details, contact Malcolm Westwood, Organizing Secretary, SEANET, PO Box 13, Penang, West Malaysia.

GREENSBORO NC
NOV 24-25

The 4th annual Greater Greensboro Hamfest will be held on November 24-25, 1984, from 9:00 am to 5:00 pm, at the National Guard Armory, 1100 Franklin Boulevard, Greensboro NC. For advance tickets, send an SASE to Fred Redmon N4GGD, 2305 Sherwood Street, Greensboro NC 27403. For dealers' space, tables, and flea market information, contact Coy Hennis WD4NHL at (919)-294-2841.

OAK PARK MI
NOV 25

The Oak Park High School Electronics Club will hold its 15th annual Swap N Shop on Thanksgiving Sunday, November 25, 1984, from 8:00 am to 4:00 pm, at the Oak Park High School, Oak Park MI. The doors will open at 6:00 am. Admission is $2.00 and 8-foot tables are $6.00. Refreshments will be available. For more information, send an SASE to Herman Gardner, Oak Park High School, 13701 Oak Park Boulevard, Oak Park MI 48237, or phone (313)-968-2675.

HAM HELP

I need a VLF receiving converter similar to the now-discontinued MFJ-332. Its input should be 1 MHz and below, and its output should be on one of the HF ham bands, preferably 10 meters. I will buy a used MFJ-332, a kit, a circuit, or any other equipment.

Roger Coppock
2800 South 10th Ave.
Broadview IL 60153

Would someone please help me find a schematic or manual for a Communications Power, Inc., model WM-1000 wattmeter? I will gladly pay for any costs incurred.

Richard Whipkey AD6X
866 Yolo Way
Livermore CA 94550

Wanted: microwave X-band diodes. All types: detector, Schottky, and Gunn. I can evaluate unknown or unmarked diodes. Also GaAsFET wanted for 12 GHz. Write with price and description or data.

K. Boufal
244 Fitzwater Street
Philadelphia PA 19147

I need to borrow Sam's Photofacts numbers SD-13 and SD-15, so that I might photocopy the sections on the Bearcat BC-210 and the BC-250.

Scott Welch
3015 E. Bayshore Blvd. #113
Redwood City CA 94063

I need help writing a program to interface a TI-99/4A computer to a Kantronics UTU.

Bill Trojanowski N2EZG
RD #2
Alpine NY 14805
(607)-594-3544

Teachers/students—I want to get in touch with those interested in forming a net to use communications in the classroom as part of teaching/learning.

Karen KB6DDQ
PO Box 927
Camarillo CA 93011

HELP! I've inherited a Tennelec Memoryscan MS-2 without instructions. I'm looking for a service manual and code book. I'll pay copying and postage.

Gerald Ruettiger
780 So. Woodland
Orange CA 92669

I am looking for a manual for the TT299B/UG MITE Teletype® unit. Will be glad to pay any reasonable price.

Gordon Willard WA0VNK
12764 Allenhurst Drive
Bridgeton MO 63044

I own two Comtron base power amplifiers, 500-Watt model 974-A, 146-174 MHz, and am in desperate need of an operator's/service manual. I'll pay reasonable copying costs and postage.

Mr. Nick Vukelja
Apartado 6-1826
Panama, Rep. of Panama
Tel. 26-7413

I am looking for an instruction manual and schematic for a Dumont 304-A oscilloscope.

Fred Wood WB3JKC
1020 W. Lanvale St. #1
Baltimore MD 21217

I have a TRS-80C, Kantronics software, and an MFJ TU-1224. I would like to use a Model 28 as a printer. Can anyone help?

John Gill
6000 Duda Rd.
House Springs MO 63051

I need schematics, manuals, and any tips I can get for a Browning model ON-5A oscilloscope. I will gladly pay any costs for mailing and copying. Part of the trace is scrunched up on the right-hand side of the CRT.

Rick Wilson
604 South German Town Rd.
Chattanooga TN 37412

✓ See List of Advertisers on page 98

W2NSD/1
NEVER SAY DIE
editorial by Wayne Green

from page 6

employees brought a mass of them.

Between the people at *Byte*, WGI, and WGE in Peterborough, I'll bet there are over 500 Wayne Green people in this town of 5,000. It seems as if I get waved at and greeted by almost every other car as I putt around on my new Yamaha.

By passing along the things I have learned through the years, I've helped at least a couple thousand people learn about publishing, electronics, and computers—and that doesn't count the readers I've influenced. I visited one of the computer publishers a few days ago only to find a solid fan who got hooked while reading *73*. He claimed that my editorials pushed him to get into business—drove him to it. He's worth millions today.

We're moving along to start a magazine publishing institute as soon as we can get a building large enough to handle the project. This will be even better than the system I've used in the past, for every student will not only work at every job on a magazine (from proofreading to collecting for advertising), but will be paid for the work. They'll be working on real live publications, too, not just school stuff. No more of this Catch-22 nonsense of having to have practical experience before you can get a job that will let you get practical experience. Graduates will have a resumé citing plenty of good practical professional experience.

I'm hoping to start a yearly alumni meeting at Comdex. So, if you know of anyone who has worked for me during the last 33 years, have them get in touch. I'm having some special coffee mugs made with the logos of all our magazines as souvenirs. Who knows, I may spring for tee-shirts next year! There are lapses in my usual Yankee thrift approach to life.

The dinner will be November 15th in Las Vegas and I want every Wayne Green alumni who can make it to be there. As far as I know, with the exception of two people who betrayed me, one of whom is dead and the other who has completely disappeared from the publishing and computer scene, every alumni is still a darned good friend.

And, with the Green Publishing Institute opening soon, think how many we'll be seeing next year! The whole computer industry is desperately in need of people with publishing experience. This could help enormously to improve the output of spec sheets and instruction books, give the industry much better advertising and catalogs, and so on.

So, alumni, let's get together at Comdex and celebrate! Drop me a note so I can give you details. I'm looking forward to seeing you again, even if you're working for (sob) *Byte* or Ziff-Davis.

NEWSLETTER OF THE MONTH

MAARC
MID-ATLANTIC AMATEUR RADIO CLUB

REMARCS

"All the news that fits, we print" seems an appropriate motto for *REMARCS*, chronicle of the Mid-Atlantic Amateur Radio Club. Editor Kay Craigie KC3LM realizes that no one wants to read endless minutes and committee reports month after month. After all, those who are interested in that brand of tedium can hear it all at the club meeting. Instead, Kay draws upon outside sources such as *Westlink*, *Worldradio*, and the *W5YI Report* to fill *REMARCS* with truly interesting information. For the purist, there are still plenty of club- and member-related articles, and Kay's subtle humor makes even the dreaded meeting announcement a pleasure to read.

On the mechanical side, "immaculate" sums things up. The printing is of professional quality, the pages are nicely composed, and there are no typographical errors to be found. Can you say the same for your group's publication?

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

$$ HOME-BREW III $$

Turn your hot solder into cold cash! Once again, *73* is searching for the greatest home-brewer in the land. All projects have a chance to appear in *73*, and the best of the best will be showered with fame and fortune.

Top prize is $250. Second place is worth $100, and three runners-up will each earn $50. Of course, this is in addition to the payment every author receives for publishing in *73*.

Contest Rules

1. Entries must be received by November 1, 1984.
2. To enter, write an article describing your best home-brew construction project and submit it to *73*. If you haven't written for *73* before, please send an SASE for a copy of our author's guide.
3. Here's the catch: The total cost of your project must be $73 or less, even if all parts were bought new. Be sure to include a detailed parts list with prices and sources.
4. Our technical staff will evaluate each project on the basis of originality, usefulness, reproduciblity, economy of design, and clarity of presentation. The decision of the judges is final.
5. All projects must be original, that is, not previously published elsewhere. There is no limit to the number of projects you may enter.
6. All rights to articles purchased for publication become the property of *73*.
7. Mail your entries to:

73 Magazine
Editorial Offices
80 Pine Street
Peterborough NH 03458
Attn: Home-Brew III

LETTERS

BE A VE

The American Radio Relay League is preparing to serve as a Volunteer Examiner Coordinator (VEC) in each of the 13 FCC call areas (more than one VEC may serve in a particular area). In anticipation of becoming a VEC very soon, the ARRL is recruiting licensed Advanced- and Extra-class radio amateurs to serve as Volunteer Examiners. Applicants are *not* required to be ARRL members to participate. Applicants must, however, hold a current Advanced- or Extra-class license, have no history of license suspension or revocation, and be at least 18 years of age.

The Volunteer Examiner Program covers testing for Technician-, General-, Advanced-, and Extra-class licenses. Novice exams will continue to be given by Novice Examiners under the new Novice rules (97.27 (a) and (c); 97.28 (b); et al); Novice license testing is entirely separate from the Volunteer Examiner Program.

Under the Volunteer Examiner Rules adopted by the Commission, only Advanced- and Extra-class licensees may administer exam elements above the Novice level (97.28 (a)). Extra-class licensees may administer all written and Morse-code elements; Advanced-class licensees may administer only exam Elements 1A, 2, and 3 (Elements required for the Technician license). And, of course, you must be accredited as a Volunteer Examiner by a VEC before you are authorized to administer any upgrade examinations.

If you qualify and are interested in participating as a Volunteer Examiner with ARRL's VE Program, please request an application by writing to Volunteer Examiner Accreditation, American Radio Relay League, 225 Main Street, Newington CT 06111.

Steve Place
ARRL
Newington CT

EARN IT

I agree with the editorial comment in June, 1984, that ham radio is in trouble. There are so many hams like my friend who upgraded a desire to use our designated frequencies to a "right" to those frequencies. There is no such thing as a right. We have to earn the use of the bands

we occupy. The only way I can see to earn them is through the emergency service route. I can't see how we can do it through our advances in technology like we have done in the past. Some hams claim to be advancing technology through their use of computers attached to peripherals for RTTY, CW, packet, AMTOR, and whatever. In my mind those aren't advances. Any Bash graduate who doesn't own a soldering iron can plug those store-bought boxes together and claim he's a great innovator.

But how in the world do we start from scratch and truly do some real ham-style developing? To me that is a serious question.

What's the difference between my sitting here in my shack running my keyboard on AMTOR or packet? I didn't build these things. I bought them. I feel this keyboard operating is not one step above gibbering on SSB. In fact, I think keyboard is beneath CW, particularly on a hand key or my 1939 McElroy Bug! So where do I go technically on the HF bands? (Moonbounce is something else.)

I grant you that traffic by keyboard and printer is a good emergency mode. But damn, I can't see it even after I bought the junk to do it. AMTOR? It's as dull as keyboard CW. Same for packet. No skill.

I'd like to experiment with digital voice. I know how AT&T's "T Carrier" works and their digital radio works, but I don't know how to build an experimental system or where I can get parts if I knew how to do it. So much for my innovating.

Let's test for CW proficiency. Good idea. Let's periodically examine state-of-the-art knowledge as well. Forget this grandfather business and let's make all ticket-holders prove they deserve their operating "rights" and station license.

By definition, I'm not a curmudgeon, but I'm in the retired bracket that you so labeled. I've had a ticket since 1940 and an Extra class since the days when the RI made me send the 20-wpm test on a hand key. I like to experiment, but I do use the KISS approach.

Enough of this blithering. We have to protect the frequencies that we are permitted to use. We need the energy of the young. But I don't know how to attract them. I loaned receivers to two teenagers and about three months later they gave them back and told me that hams are no different from the CBers they talk to. Now what?

I hate to see the ultimate loss of the ham bands, but unless we start earning them, no equipment manufacturers' lobby will save us.

Keep writing and I'll try to stir up some ARES type of action out here.

Ken Uthus KT7E
Nine Mile Falls WA

SUPER

Well, once again I am impressed by *73*. I took a while to type the code program in "Sounds Good to Me," June, 1984. Mike W5VKC/1 and Rick WB5AYD did a great job of putting it together. Congratulations to them for it. They at least took the trouble to translate it for both the VIC-20 and the C-64. That is not done in some magazines.

As per usual, my typing contained a multitude of mistakes. I listed the results to my printer, proofread it (I thought), and sent Mike a copy and asked him to tell me what happened. I was expecting a letter in about a month. I was surprised to receive a personal phone call from Mike (and it was not even collect!). He straightened me out on the mistakes that I had typed in and one that I missed in the translation in his printer. When I corrected my mistakes, the program worked!

Today in the mail I received an MCI Mail from Mike telling me what we discussed over the phone. What service!

Keep up the good work. I have *73*s dated to September, 1968 (73 cents yet). The collection is not complete but it is large. I read with delight your petition to the FCC about the code. I agree with you on your stand on the no-code license and the stiffer theory requirement.

Your *RUN* magazine is on my computer shelf. I have a Commodore 64 and a VIC-20 that I use for RTTY on the HF bands. I am not active on HF now because I need to work over my HF rig. It won't cooperate with me when I send RTTY tones through it. I have the C-64 capable of RTTY through the Santa Fe 147.81/.21 repeater. Not much activity except me right now. Hope I can have someone to talk to soon.

Another of your writers deserves a large pat on the back—Jim Grubbs. I followed his articles in *Commander Magazine*. I corresponded with him via word processor and he was a great help.

Thanks for lending me your ear (eye?), Wayne. Once again keep up the good work. Your people are super.

Alan F. Hill N5BGC
Santa Fe NM

BECKONING BEACON

I have had a beacon operational for over a year. The beacon is on 24 hours a day, seven days a week. Although I have received many QSLs from around the country, a little publicity of the beacon's frequency would be very helpful. I have placed the beacon high in the six-meter band so as not to interfere with local activity and thus it is not easily found. The frequency is 50.440 and the location is Burlington, Connecticut. QSL to K1NFE at PO Drawer M, Plainville CT 06062.

A. DePascale K1NFE
Plainville CT

THANKS, FRANK

I noted in your July, 1984, editorial that you have sold a bunch of your magazines. I sincerely hope this did not include *73*, or at least that you will still retain editorial control over this magazine.

I held a ham ticket from 1948 to 1975, when I let my license lapse, beginning as

✓ See List of Advertisers on page 98

Chief Operator of XAFQ/Trieste, then W5PVE, W2MJF, W8WUN, and W4LJD. I intend to get my code speed back up a bit—I once could copy 35 wpm solid with a stick, but right now 10 wpm poses a bit of difficulty. I'll brush up on theory and take the exam again for a General-class ticket. Then I shall be QRP on CW from 40 through 10. In 1949, I put K4WAR/A4WAR on the air with separate kWs on all bands and a nice antenna farm at Camp (now Fort) Gordon GA. I had some patents issued during the 1950s resulting from electronics design for missile guidance in the 1950s, and from 1955 to mid-1959, I was first a Project Engineer and then a Senior Engineer with Heath Company, Benton Harbor MI.

In fact, I once sold you a short story, "Ed McGurk Makes WAS on Two Meters," which appeared in *CQ* in December, 1955, when you had that magazine—and it was a good magazine then, too. Incidentally, I received $35.00 for the story and Pappy Lynn got $50.00 for the cartoon illustrating it! Maybe I should have been an artist!

Sorry about the reminiscing. What I really started to say was that some months ago I subscribed to *QST*, *CQ*, and *73*. I am letting my subscriptions to *QST* and *CQ* run out, but I'm definitely keeping *73* because it seems to be the best ham magazine among the three at present. I particularly like the construction articles, but then, I like most everything else in the magazine, too. *CQ* isn't totally a loss, but *QST* is a far cry from the great magazine it was in the '40s '50s, and '60s, and definitely not worth the price anymore, to my way of thinking.

I was unaware that you were a Mensan until I noted your name in the *Register* a few years ago. I finally got around to joining the group in 1973 and am still a member.

Anyway, whatever you do, don't let *73* go the way of the other ham rags—I still have about a year to go on my subscription and intend to renew.

J. Frank Brumbaugh
Bradenton FL

CRISIS

I enjoyed your editorial in the June issue of *73* very much. Like your other editorials, it was a breath of fresh air compared to the usual vapid commentaries found in other publications. I completely agree with your comments about Morse code. I have on occasion "read the mail" (a most curious expression) on traffic nets on 2 meters and HF (more on the former) and have been totally amazed at how completely useless and boring it all sounds. In short, your conclusions about the present state of amateur radio are correct, in my opinion.

With the essentials of your argument granted, what can be done to correct the problem? I think it would be useless to go to the ARRL about upgrading the current state of radio technology since they appear to be the bastion of outmoded technology. What other groups in ham radio exist that are interested along these lines, and which could be used to bypass the intellectual ballast residing at the ARRL? (This is clearly, in my opinion, the only course open.)

Finally, are the normal emergency services (i.e., police, fire, civil defense, Red Cross, and National Guard) willing to interconnect with amateur radio? Or do they view amateur radio as completely useless (perhaps with justification)? These are just some of the questions that *need* to be answered. Can you suggest where I might look?

There is one point that you made which is in error. I do not believe that there are more technical graduates in Japan because they have a no-code license. What motivates an individual to go into a particular work? interest in that field *and* the belief that it is worthwhile. If a person is taught that scientific and industrial progress (or progress alone for that matter) is good, then, if he has the interest, he'll choose such a career. But if (as he is taught in the US today) he is taught that scientific and industrial progress is evil, that reason is impotent, etc., then he will not go into those areas, even if he has the interest! After all, why become an engineer when objectivity is impossible and there are more important social concerns (I don't agree with either idea). Thus, this crisis (i.e., lack of young technical people) is just the tip of a larger philosophical crisis, in my opinion! It is a mistake to view it in any other way.

Japan, for the most part (as witness their expansion in reason-oriented areas), does not suffer to the same extent from this philosophical crisis. I believe that the Japanese have a better grasp of the essentials of this issue and are doing better, which is *why* they have a no-code license (i.e., the no-code license is a result and *not* a cause).

Thank you and keep up the good work!

Chris O'Hara N1CRA
Fairfield CT 06432

The bankruptcy of amateur radio is still a well-kept secret. Having worked on NIAC with representatives of the other communications services, I can assure you that word has not yet leaked out as to the disaster we've generated and we will still get full cooperation.—Wayne.

SOFTWARE PIRACY

There is a problem in the amateur-radio fraternity. . .software piracy. Whether by ignorance or simple disregard for the law, many amateurs are stealing copyrighted programs. Most do not consider their theft a crime or a serious problem, but unless this practice is discontinued, amateur radio will suffer.

With the influx of computers into the hobby, a degree of software piracy was inevitable. Unfortunately, the problem has become a blemish on amateur radio. Thousands of dollars have been spent in litigation involving software piracy outside the hobby, and I had hoped amateur radio would police the problem internally and not require legal action. Sadly this is not the case.

I recently confronted two hamfest exhibitors who were selling copies of a Kantronics program. These people were copying and selling our programs to any amateur willing to pay the price. I bought one of the programs for evidence and informed the seller that legal action would be taken. This person was not a ham, but those buying the programs were. We have several other examples of programs copied and sold.

There are a few simple steps we can all take as those interested in seeing the problem solved:

1. Never buy copied software.

2. Report pirates to the software manufacturer.

3. Don't allow illegal sales at your local hamfest.

Kantronics plans to prosecute those who steal our programs, as we have in the past. But without the assistance of the entire amateur community, the manufacturers will not be able to stop pirates from stealing their profits. If manufacturers are not able to sell enough product to make a profit, other new and improved programs will not be written. Don't let the greed of a few deny the hobby of future expansion. Let's throw the bad apples out before they ruin the whole barrel.

Mike Forsyth
Marketing Director
Kantronics, Inc.

SHARING IDEAS

"Perfboard and Soldertail?", which appeared in the July, 1984, issue of 73, has brought some welcome correspondence. The letters below add some important ideas to those in the article. More importantly, they illustrate one of the most important ideas in ham radio: the willingness to share freely experience and ideas that might help other hams. I want to thank both gentlemen for writing and for adding to my own stock of construction ideas. No one knows everything, and perhaps it is even true that none of us knows very much. But together, we know a lot of very useful things about many matters.—L. B. Cebik W4RNL.

I read your article in *73* for July, 1984, "Perfboard and Soldertail?", with interest. I have been a ham for over 40 years and have constructed countless projects. The ideas you described are good, and I picked up a few new thoughts from your text. Many thanks!

I'm writing to pass along a few tips that I have found helpful, in the hopes that you can use them, too. Here they are!

Cutting perfboard and PC material is easy to do without sawing. If you score both sides heavily (I take a couple of passes per side with the board held flat on an old magazine, using a heavy razor knife from the hardware store—the kind of knife that has replaceable blades—I use one made by Millers Falls that stores the blades in the heavy aluminum handle), it will break cleanly along the score. It hardly even needs touch up with a file for neatness, but that is a good finishing touch. I find it much easier than sawing, and I have never had a split or chip.

You are right about pencil marks causing leakage paths with CMOS circuits. Another maddening cause of the same thing is solder flux, which causes a problem when the humidity is high. The only cure I have found is to use a commercial flux remover on the board (Radio Shack's is OK). Isopropyl alcohol does not work well and sometimes makes the problem worse due to its water content.

Forming leads on small parts can be done beautifully with a small pair of "chain-nose" pliers. Available in good hardware stores and hobby shops, the jaws have circular cross section. They are not really as suited for gripping as regular pliers, but they do a swell job of forming nicely rounded bends. I think they were originally designed to make small chain links.

I also find it very helpful to keep one of those tapered red-plastic lead formers handy, to get the exact lead spacing on resistors, etc. I think you can get them from Radio Shack, but I have had mine so long, I am not sure.

I have had problems drilling large holes, say, over about 3/16 inch. I find the board often cracks if the hole is near an edge. I have been using two reamers instead. One is a regular T-handle 1/8-to-1/2-inch size, and the other is a model-maker's reamer (from Brookstone) that goes from almost nothing to about 1/8 inch. Perfboard material is so soft that you can often ream a super quality hole faster than setting up to drill it. It also is a good solution for that hole size for which you don't have a drill.

When mounting a PC or perfboard parallel to the chassis surface, I always have (it seems) minor problems getting all holes to line up. It seems to work better for me to not use 4-point mounting (mounts in the corners), but to use 3-point mounting instead. Generally, when things don't quite line up, only one hole need be moved. Three points determine a plane, and it works well for me.

A really neat way to mount boards, when you are pretty sure the debugging phase is over, is to mount them parallel to the front panel, supported on the front-panel controls. For example, if you have a couple of switches and a pot, it usually is possible to arrange the parts so that selected surfaces are equidistant from the panel surface. You can either epoxy (if you are really sure!) the board to the controls (such as to the back surface of a pot) or (better) solder the lugs of the switches to pads on the PC board through small access holes. It sounds cumbersome, but it often can be done and leads to a really nice looking arrangement. On occasion, I have used this technique by soldering heavier-than-usual leads on the panel controls (#16 or #18 wire) and passing these leads through the perf- or PC board, soldering them to the pads, etc. With several such leads, the whole thing is surprisingly sturdy. The rest of the chassis is yours to do with as you like—it is like free additional space!

When using quite thin wire (such as wire-wrap wire), if the long runs are left quite loose, after the job is done, it can be made to look neater by pulling a loop of the long lead through an unused hole on the perfboard, just to tighten up the lead. Judicious selection of the "stitch" hole can also restore those right-angle bends to otherwise diagonal runs.

A super easy way to make PC boards from articles when you wish to etch the board conductors is to do the job backwards. Instead of etching and then drilling, make a photocopy of the board from the magazine and scotch tape it to the PC board. Using a small drill (I really prefer the hand-held battery-powered jobs; they are easier to control and more convenient than a big drill or a Dremel tool, unless you have a permanent shop setup), drill right through the photocopy and your PC board, until all holes are in place. Then remove the photocopy, deburr as necessary, and scrub the copper surface in the kitchen sink using SOS scouring wool. When the copper is bright, rinse it and leave the tiniest trace of regular dishwashing detergent on the surface. It will cause etch-resist pens to write beautifully. With little effort and practice, you can draw the conductors; you can even make a hybrid arrangement with some prepared wax patterns, IC pads, if you wish. It is also your golden opportunity to add your name, call, date, revision number, or whatever. After the board is etched, a little cleaning is all you need before stuffing. Try it, you'll like it!

As I said, I enjoyed your article and hope you find one or more of my ideas to be helpful, too.

Warren Offutt AF9Q
Geneva IL

I read your article in *73* on perfboard construction practice. Very thorough, but I would like to add my two cents:

I have gravitated away from using phenolic perfboard because it is so *fragile* and doesn't have a high enough insulation resistance for some high-impedance

circuits. The same goes for epoxy paper. They are moisture sensitive.

I prefer to use G10 or FR4 (or similar) epoxy-fiberglass perfboard. One source is Vector P pattern, available from industrial electronics parts houses. It is easily cut by scoring it on both sides with a utility knife held against a straightedge, clamping the part in a vise or between a tabletop edge and a rigid sheet of metal, etc., and then giving it a "karate chop" to get a clean break. The extra expense of the premium perfboard is well worth it in avoiding duplication of effort if the circuit is dropped or doesn't work right.

I have even used G10 perfboard for rf circuits. Vector sells a version with *continuous copper* on both sides. Isolated pad "cookie cutters" are then used to develop a circuit. These tools are available from Vector or A. F. Stahler (if they are still in business). Stahler parts were carried by Trumbull (if he is still in business). I believe I bought a "bubble etcher" from Trumbull a while ago, but I have mislaid it because I have moved several times since. I would like to locate Trumbull again or someone who has taken over the line. I use perfboard for breadboards and prototypes, and PC for finished models if it is worth the effort.

Two useful tools for working epoxy-glass perfboard are a "nibbling tool" (to cut irregularly shaped holes) and a "tapered reamer" (to enlarge round holes drilled with a hand-twist drill chuck). These are available from Sears, Radio Shack, etc.

I agree that it is wise to socket all semiconductors in a breadboard. Also, those threaded metal spacers (Mouser? et al) are very useful to aid in mounting. Masking tape and a ball-point pen can provide labels of important circuit tap points. Wiring going off the perfboard should be stranded/insulated, but solid insulated will work on-board.

Well, that's all I have to relate, now. I am not a ham yet but am an electrical engineer in telecommunications circuit design. I am working towards a Technician's license because I got interested in homebrew microwave and satellite TV links and need a ticket to transmit. MDS downconverters can be used on 2304 MHz.

Keep up the good work. With much of electronic technology going to Japan, it is difficult for a new engineer to gain practical experience. Ham radio is a useful thing to an American technician or engineer wishing to hone his skills.

Raymond Barcklow, Jr.
Columbia SC

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

WORLDWIDE AWARDS DIRECTORY

If you like to go after awards or win contests, this directory is a must! Volume 1 lists over 270 awards from all over the world with names and addresses, costs, and descriptions. $9.95 brings Volume 1 to your doorstep. Volume 2 is in production now and will cost $5.95 for an additional 130 awards. Why not order Volumes 1 and 2 for a combined price of $12.75? The *Worldwide Awards Directory* is for the amateur-radio operator who is interested in showing his proficiency at radio communications to others throughout the world. You will never know how easy it is unless you know how to go about it. You probably already have enough QSLs in your files for some of the awards. $9.95 includes all postage and handling. COD extra. Quantity discounts available.

Also, if you know some awards that you would like listed, please let Larry know and they will appear in the next volume. Write to: Larry Kebel KBØZP, 736 39th Street, West Des Moines IA 50265.

INLAND STEEL ARA

The Inland Steel Amateur Radio Association will operate special-event station K9DWL to commemorate The Little Red School House and Hammond, Indiana's centennial year, from 1400Z to 0000Z on Saturday, October 6, 1984. Frequencies: phone—General-class portions of 10, 15, 40, and 80 meters; CW—Novice-class portions of 10, 15, 40, and 80 meters; 2-meter *FM—146.42 simplex.* Send legal-size SASE for certificate to Lucy Schendera N9DTG, 812 E. 40th Place, Griffith IN 46319.

ST. PETERS ARC

The St. Peters Amateur Radio Club will operate a special-event station from 1700 UTC, Saturday, October 6, to 1700 UTC, October 7, at the Daniel Boone Home, Femme Osage Valley, St. Charles County, Missouri. The event is to commemorate the place where Daniel Boone; frontiersman, judge, trapper, surveyor, builder, and family man, spent the last twenty years of his life. The weekend celebration features a black powder marksman contest for local participants. One complete 2-way contact is needed to obtain a presentation-quality certificate on aged parchment featuring a picture of the Boone Estate and an information brochure of Boone facts. SPARC will operate KBØJ on plus or minus 3.915, 7.240, 14.280, 21.420 depending on conditions and band activities. A coonskin cap will also be awarded to the first operator making contact on all four bands. One dollar or 3 IRCs with calls and time of contact should be sent to Tim Haake WAØTSY, 128 Lake Point Drive, St. Peters MO 63376.

CENTER OF THE US

The Central Kansas ARC of Salina KS will operate WØKQU from the marker of the geographical center of the US in Lebanon KS. Operation will be from 1700Z October 6 till 1900Z October 7, 10 kHz up from the lower end of the General-class 10-80-meter bands. Certificate via KBØBH, 2358 Aurora Ave., Salina KS 67401.

COLUMBUS DAY

The Columbus Amateur Radio Association will be holding its second annual Columbus Day Special Event to provide a triple salute to Christopher Columbus, the City of Columbus, and amateur radio worldwide, on October 6-7, 1984. CARA's club station, W8TO, *located* at the Center of Science and Industry, will try to contact as many stations as possible around the world.

Eligibility

Open to all amateur-radio operators worldwide, to be divided into two groups: Columbus OH (and suburbs) amateurs; all other amateurs.

Bands

Saturday, October 6, 1984—1400Z to 2400Z—15 meters phone at 21.375 MHz ± 10 kHz.

Sunday, October 7, 1984—1400Z to 2400Z—40 meters phone at 7.240 MHz ± 10 kHz.

Exchange

Name, QTH, and RST.

Scoring

One point for each contact (excluding W8TO), six points for a W8TO contact. A final score of 10 must be submitted to be eligible for a certificate. Scores must be submitted within 120 days to be valid. Certificates will be issued to all qualifying amateurs who include an SASE (SAE and 3 IRCs for DX). SWLs may receive the certificate on a station-heard basis.

A mini contest will be in operation during the event *period; the highest score* from a Columbus amateur will receive a plaque.

All requests for certificates and correspondence should be sent to Amateur Radio Station W8TO, Attn. Special-Event Coordinator, 280 East Broad St., Columbus OH 42315.

CENTER OF US POPULATION

The Jefferson County Amateur Radio Club will be operating special-event station KAØIAR from De Soto MO, the center of US population, on October 13, 1984, from 1500Z to 2400Z.

Operation will be in the lower ends of the 40-, 20-, and 15-meter General bands. There will be some CW in the Novice portion of the same bands.

For a certificate, send an SASE and QSL to KAØIAR, 3009 High Ridge Boulevard, High Ridge MO 63049.

HAT ROCK

The Hermiston Amateur Radio Club will operate KC7LK from Hat Rock State Park from 1800 GMT, October 13th, to 0100 GMT, October 14th, and between 1800 and 2200 GMT on October 14th. The station is commemorating the 179th anniversary of Lewis and Clark's visit to Hat Rock and will be operating in conjunction with the Oregon QSO party.

Operation will be on the General phone and Novice CW bands. There will also be some 2-meter and 440-MHz operation. For a certificate, send on SASE and your contact number to the Hermiston Amateur Radio Club, PO Box 962, Hermiston OR 97838.

QUEEN CITY

The Clarksville Amateur Transmitting Society will be operating a special-event station celebrating the 200th anniversary of Clarksville TN, the Queen City on the Cumberland River. The dates and times are as follows: October 13, 1984, from 1400Z to 2400Z and October 14, 1984, from 1800Z to 2200Z. The call of this station will be N4GMT. Modes of operation will be SSB, CW, and RTTY. Frequencies of operation will be around 21.375 MHz, 14.280 MHz, and 7.240 MHz. A commemorative QSL certificate will be sent for every SASE received. QSL via KB4EFW, Rt. 1 Box 162A, Indian Mound TN 37079.

SUNBELT AGRICULTURAL EXPO

The Colquitt County Ham Radio Society will be operating club station WD4KOW from the site of the seventh annual Sunbelt Agricultural Exposition on October 16, 17, and 18, 1984. The hours of operation will be 0900 to 1700 EDST each day.

This annual Sunbelt Expo is held each year at Spence Field Airbase, located near Moultrie, Georgia, and is the largest agricultural show in the South. This event draws over *200,000 visitors from all* over the United States and foreign countries.

Operations will be in the General portion of the HF bands. The members will also be listening for visiting hams on the local repeater 146.19/.79. Visiting hams are invited to visit the amateur booth at the Expo and operate the amateur station.

A special OSL card is available for those making contact during this event and submitting an SASE.

J. GORDON COOGLER POETRY FESTIVAL

On Saturday, November 3, 1984, K4MJN will operate a special-event station in Blythewood SC to commemorate the birthplace of J. Gordon Coogler (1865-1901).

J. Gordon Coogler has been acclaimed by literary critics as the WORST practicing poet in US literary history! His verses are now known as Cooglerisms, as is any other work since that falls into that same critical disdain. Many literary societies of today award the Coogler Award for the worst published works of the year. But here in Blythewood (Population 93) we're very proud of our native son and celebrate his accomplishments with a festival and poetry contest.

K4MJN will operate on or around 14.290 MHz from 1400Z to 1800Z and on or around 21.390 MHz from 1800Z to 2200Z. Join us!

All stations working K4MJN during this second annual festival will receive a handsome certificate with a photo of The Bard of Blythewood and some of his poetry. Send a large business-size SASE with your QSL and contact number to J. David Suggs K4MJN, Rt. 3, Box 154, Blythewood SC 29016.

BOMB SQUAD

The BOMB Squad (Best of Mt. Baldy) will operate W6HCP (Hollywood Christmas Parade) from 1600Z on November 25 to 0400Z on November 26, 1984. Operation from the parade communications center of the 1984 Hollywood Christmas Parade will be on 7.284, 14.284, and 21.284 MHz, SSB. SASE to W6GVR for special commemorative QSL.

WORKED ALL ZONES

The WAZ Award is issued to any licensed amateur station presenting proof of contact with the forty zones of the world. This proof shall consist of proper QSL cards, which may be checked by any of the authorized *CQ* checkpoints or sent directly to Mr. Leo Haijsman W4KA, WAZ Award Manager, 1044 Southeast 43rd St., Cape Coral FL 33904. Many of the major DX clubs in the US and Canada and most national amateur-radio societies abroad are authorized *CQ* checkpoints. If in doubt, consult the WAZ Award Manager. Any legal type of emission may be used, providing communication was established after November 15, 1945.

The official *CQ* WAZ zone map and zone list will be used in determining the zone in which a station is located.

Confirmation must be accompanied by a list of claimed zones using *CQ* form 1479, showing the call letters of the station contacted within each zone. The list should also clearly show the applicant's name, call letters, and the complete mailing address. The applicant should indicate the type of award for which he is applying, such as all-SSB, all-CW, or mixed. In remote locations and in foreign countries, a handwritten list may be submitted and will be accepted for processing, provided the above information is shown.

All contacts must be made with licensed, land-based, amateur stations operating in authorized amateur bands.

All contacts submitted by the applicant must be made from within the same country. It is recommended that each QSL clearly show the station's zone number. When the applicant submits cards for multiple callsigns, evidence should be provided to show that he or she also held those call letters.

Any altered or forged confirmations will result in permanent disqualification of the applicant.

Include with the application the processing fee (*CQ* subscribers—$4.00; nonsubscribers—$10.00) and a self-addressed envelope with sufficient postage stamps or IRCs to return the QSL cards by the class of mail desired and indicated. *CQ* subscribers should include a recent mailing label (or copy) with application. IRCs equal in redemption value to the processing fee are acceptable. Checks should be made out to Mr. Leo Haijsman, WAZ Award Manager.

In addition to the conventional certificate for which any and all bands and modes may be used, specially endorsed and numbered certificates are available for phone and single-sideband operation. The phone certificate requires that all contacts be two-way phone; the SSB certificate requires that all contacts be two-way SSB.

If, at the time of the original application, a note is made pertaining to the possibility of a subsequent application for an endorsement or special certificate, only the missing confirmations required for that endorsement need be submitted with the later application (provided a copy of the original authorization signed by the WAZ manager is enclosed).

Decisions of the *CQ* DX Awards Advisory Committee on any matter pertaining to the administration of this award will be final.

All applications should be sent to the WAZ Award Manager after the QSL cards have been checked by an authorized *CQ* checkpoint.

Zone maps, printed rules, and application forms are available from the WAZ Award Manager. Send a self-addressed envelope (4" × 9-1/2") with 28 cents postage, or a self-addressed envelope and 2 IRCs. For rulings on borderline areas, consult the WAZ Award Manager.

Single-Band WAZ

Since January 1, 1973, WAZ Awards have been issued to licensed amateur stations presenting proof of contact with the 40 zones of the world on one of the five high-frequency bands, 80-10 meters. Contacts for a single-band WAZ award must have been made after 0000 hours GMT, January 1, 1973. Proof of contact shall consist of proper QSL cards checked by the DX Editor, the WAZ Manager, or an authorized *CQ* checkpoint. Single-band certificates will be awarded for both two-way phone (including SSB) and two-way CW. The single-band WAZ program is governed by the same rules and uses the same zone boundaries as the regular WAZ Award.

5-Band WAZ

On January 1, 1979, the *CQ* DX Department, in cooperation with the *CQ* DX Advisory Committee, announced the 5-band WAZ.

Applicants who succeed in presenting proof of contact with the 40 zones of the world on the five high-frequency bands—80, 40, 20, 15, and 10 meters (for a total of 200)—will receive a special certificate in recognition of this achievement.

These rules were in effect as of July 1, 1979, and supercede all other rules. Five-band WAZ will be offered for any combination of CW, SSB, phone, or RTTY contacts, mixed mode only. Separate awards will not be offered for the different modes. Contacts must have been made after 0000 hours GMT, January 1, 1979. Proof of contact shall consist only of proper QSL cards checked by the WAZ Award Manager. The first plateau will be a total of 150 zones on a combination of the five bands. Applicants should use a separate sheet for each frequency band, using *CQ* form 1479.

A regular WAZ or single-band WAZ will not be a prerequisite for a 5-band WAZ certificate. All applications should show the applicant's WAZ number.

After the 150-zone certificate is earned, the final objective is 200 zones for a complete 5-band WAZ. *CQ* is donating plaques for the first 5 winners, after which the applicant will have a choice of paying a fee for his plaque and/or applying for an endorsement commemorating this achievement.

The applications should be sent to the WAZ Award Manager. The 5-band Award is governed by the same basic rules as the regular WAZ and uses the same zone boundaries.

PETERBOROUGH ARC

The Peterborough (Ontario) Amateur Radio Club is offering a distinctive bicentennial certificate to amateurs contacting Peterborough amateur stations during 1984. Ontario stations must contact five Peterborough amateurs, North American stations must contact two, and DX stations must contact one. Use any band, any mode.

Send $1 and a list of contacts as well as date and time of contact (no QSLs required) to: Peterborough Amateur Radio Club, PO Box 1205, Peterborough, Ontario K9J 7H4.

ISLAND DX AWARD

The IDX Award, sponsored by the Whidbey Island DX Club, is one of the most sought after awards in the DX community. This award is available to licensed amateurs and shortwave listeners worldwide.

The IDX Award is issued for SSB, CW, RTTY, SSTV, and mixed mode, as well as for mixed- and single-band accomplishments. Applicants must work fifty (50) IDX islands for the basic award. Endorsements are given in increments of 50 islands, up to and including the maximum number of islands possible.

Only DXCC countries which are bona fide "islands" are qualifying contacts. A special IDX listing appears within this column. To be valid, all contacts must have been made after October 1, 1977.

To apply, prepare a list of qualifying contacts in prefix order. Please number your contacts 1 through 50, etc. Include the call of the station worked, IDX island name, band, mode, date, and GMT.

Do not send QSL cards! Have your list verified by two amateurs or local radio-club officials. Confirmation of each contact must be in the applicant's possession at the time it is being verified. Send list of contacts along with $4 in US funds only and a business-size SASE to the following address (foreign stations may substitute 20 IRCs for the fee): Whidbey Island DX Club, Attn: IDX Award, 2665 North Busby Road, Oak Harbor WA 98277.

Rules governing this award program are reviewed annually in the month of September. Please enclose an SASE with any enquiries regarding this award program.

The IDX Awards Program uses DXCC countries which are bona fide "islands" as recognized by the National Geographic Society. The first criterion is that each must have been a DXCC country on or after October 1, 1977, as stated on the DXCC List of the ARRL. Any "qualifying" DXCC country omitted from this list by error or which has been recognized for DXCC after the release of this listing will be added the next time it goes to press. In the meantime, applicants may count the new countries in their tally.

ISLAND DX COUNTRY LISTING

A3	HK0 (Bajo)	PY0 (Trini)	VS6
A9X	HK0 (Malp)	S7	VS9 (See 8Q)
BV	HK0 (San An)	S9, CR5	VS9K
C2	IS	SV (Crete)	VU7 (Andaman)
C6	J3, VP2G	SV (Dodecan)	VU7 (Lacca)
CE0A	J6, VP2L	T3, VR1 (Central Kiribati)	XF4
CE0X	J7, VP2D	T3, VR1 (East Kiribati)	XP (See OX)
CE0Z	JA-JR, KA	T3, VR1 (West Kiribati)	YB, YC, YD
CO, CM, KG4	JD, KA1 (Mina)	TF	YJ
CT2	JD, KA1 (Ogasa)	TI9	YV0
CT3	JD, 7J1 (Okino)	UA1, UK1 (Franz Jos)	ZD7
D4	JW	VE1 (Sable)	ZD8
D6	JX	VE1 (St Paul)	ZD9
DU	KG4 (See CO, CM)	VK (Lord Howe)	ZF
EA6	KH1, KB	VK9 (Willis)	ZK1 (North)
EA8	KH2, KG6	VK8 (Christmas)	ZK1 (South)
EI, GI	KH3, KJ	VK9 (Cocos)	ZK2
FB8W	KH4, KM	VK9 (Mellish)	ZL (New Zealand)
FB8X	KH5, KP6 (King)	VK9 (Norfolk)	ZL (Auck-Camp)
FB8Z	KH5, KP6 (Palmyra)	VK0 (Heard)	ZL (Chatham)
FC	KH6, AH6, WH6, NH6 (Haw)	VK0 (Macquarie)	ZL (Kerm)
FG (Guad)	KH6, KH7 (Kure)	VP2A	ZM7
FG, FS	KH8, KS6	VP2D (See J7)	ZS2 (Mari-Pr Ed)
FH8	KH9, KW	VP2E	1S
FK	KH0, KH2, KG6 (Mari)	VP2G (See J3)	3B6, 3B7
FM	KC6 (West)	VP2K	3B8
FO (Clipperton)	KC6 (East)	VP2L (See J6)	3B9
FO (Tahiti)	KP (Desoth)	VP2M	3C0
FP	KP1, KC4 (Navassa)	VP2S	3D2
FR (Glor.)	KP2, KV	VP2V	3Y
FR (Juan)	KP3, KS4, HK0 (Ran-Ser)	VP5	4S
FR (Reunion)	KP4, NP4 (Puerto Rico)	VP8 (Falkland)	5B, ZC
FR (Tromlin)	KX	VP8, LU (Orkney)	5R
FW	OH0	VP8, LU (Sandwich)	5W
G, GM, GW (G. Brit)	OJ0	VP8, LU (Shetland)	6Y
GC, GU (Guern)	OX, XP	VP8, LU (Georgia)	8Q, VS9
GC, GJ (Jersey)	OY	VP9	8P
GD	P29	VQ9	9H
GI, EI	PJ (Neth Ant)	VR1 (See T3)	9M6, 9M8 (See VS5)
H4, VR4	PJ (St Maarten)	VR4 (See H4)	9V
HC8	PY0 (Fern)	VR7	9Y
HH, HI	PY0 (Peter-Paul)	VS5, 9M6, 9M8	

HAROAA AWARDS

These awards are of high quality and will make a very nice addition to any radio room. The awards are available to all licensed amateurs and amateur stations. Please do not send QSL cards. A list showing full details of the contacts (log information) should be certified by one other amateur or radio-club officer. Photocopies of your QSL cards or original log will also be permitted. At your request,

special endorsements will be added such as: CW, SSB, all YL, QRP, RTTY, SSTV, one band, etc. If you so desire, you may request separate awards for each special endorsement. Contacts may be made over any period of years. Contacts made through repeaters cannot be used. Satellites are permitted. Please pass this award information along to another amateur or post it at your local club. All correspondence or applications should be sent to: HAROAA, PO Box 341, Hinckley OH 44233, Attn: Awards Manager Gary Zimmerman WB8RTR.

Application for each award must be accompanied by three US dollars to cover handling and award costs. Payment may be made by cash, personal check, money order, ten IRCs, or first-class-rate US postage stamps. DX applicants may send a money order made out in US funds, ten IRCs, or any of the above.

If at any time your award is lost, misplaced, or damaged in any way, send the date, award number, and pertinent information and we will replace it free of charge. All awards include the special HAROAA gold seal.

Great Lakes Award

This requires one contact with each state bordering the Great Lakes: New York, Pennsylvania, Ohio, Michigan, Indiana, Illinois, Wisconsin, and Minnesota.

Super Certificate Hunter Award

This HAROAA award is designed for the serious certificate hunter. To earn this award, you must have a minimum of ten amateur-radio operating awards. Simply list the awards that have been issued to you. Special endorsements are 10, 25, 50, 75, and 100 plus.

HAROAA DX Award

This is obtained by working DX stations. It is the number of stations worked that is important. Each DX station counts as one, even if several are from the same country or area. Special endorsements for this award are 10, 25, 50, 75, 100, 200, and 500 DX contacts.

HAROAA Insomnia Award

This award is earned by communicating with one other amateur-radio station for a minimum of one hour between the hours of 1:00 and 5:00 am. A super conversation piece for your shack.

HAROAA Super Operator Award

This certificate is rendered for those providing a service on behalf of amateur radio such as weather observation, public service, emergency work, helping a new ham, providing communications for a community function, etc. The requirements are for the applicant to briefly describe the event or service. The officials of HAROAA will determine whether it deserves this special recognition.

HAROAA Official Traffic Handler Award

This award is a self-issued achievement, allowing you to display the fact that you are indeed an official handler of radio traffic.

WORKED TRUMBULL COUNTY AWARDS

The Warren (Ohio) Amateur Radio Association, Inc., announces its Worked Trumbull County (WTC), Worked Trumbull County Mobile (WTC-M), and Worked Trumbull County YL (WTC-YL) awards. These programs are designed to promote increased amateur-radio activity among and with Trumbull County amateur-radio operators. The awards also reward operating achievements.

Application: Send applications and all correspondence to: Don Lovett K8BXT, Awards Chairman, WARA, PO Box 809, Warren OH. One dollar must accompany applications from W, K, and VE amateurs; all others should send three IRCs with application. Only Trumbull County applicants must submit actual QSL cards. All others should have certification letters from two other radio amateurs which verify that they have seen and checked the applicant's QSLs. Each application must also be accompanied by a list of the calls worked, with full log data for each contact.

Requirements

WTC—For each certificate or endorsement, Trumbull County applicants must have 20 contacts with other Trumbull County amateurs. Other W, K, and VE stations must contact 10 Trumbull County amateurs, while DX applicants must have five contacts.

WTC-M—For each certificate or endorsement, Trumbull County applicants must have 20 contacts with other Trumbull County amateurs operating mobile in Trumbull County. Other W, K, and VE stations must contact 10 Trumbull County amateurs operating mobile in Trumbull County, while DX applicants must have five contacts.

WTC-YL—For each certificate or endorsement, W, K, and VE stations must contact 10 Trumbull County YL or XYL amateurs, while DX applicants must have three contacts.

Award: A certificate will be issued on each approved application but in order to appear on the certificate, special endorsements must be filed with the initial filing, each containing at least 25 percent new contacts. Initial endorsements are free of charge, but endorsements made on later dates will take the form of WTC certificates. Applications for these must contain proper filing fees. Endorsements may be all one mode, all one band, all mobile-to-mobile, or all members of the Warren Amateur Radio Association, Inc.

Net contacts, contacts made through repeaters, and contacts made before January 1, 1959, cannot be counted.

A FAR NET AWARD

The Armored Force Amateur Radio Net is a nonprofit and informal group of amateur-radio operators who are veterans or active-duty service personnel who have been assigned or attached to an armored unit of the United States Armed Forces or their allies at some time in their military careers.

The A FAR NET offers its A FAR NET Award certificate to amateur-radio operators of any nation. The 8½" × 11" certificate is printed in four colors on white on heavy stock and is intended for framing. Endorsements are available for making additional contacts and for making contacts in one mode or on one band. Application may be made for any award level, mode, or band operation at any time.

To qualify for the basic award, nonmember stations must establish two-way contact with a minimum of fifteen different A FAR NET member stations. To qualify for endorsements, non-member stations must make contact with ten or thirty-five additional members on any band or in any mode. Confirmation of the required contacts must be through a copy of the non-member's log that has been certified by two other amateur-radio operators.

Applicants for the basic award certificate must submit a minimum of fifty cents along with their application to cover postage, envelopes, etc. Endorsements not mailed along with the basic certificate will require only a normal 4½" × 6" SASE. Applications for the basic award or endorsements should be sent to: Alfred G. Beutler K2DWI, A FAR NET Certificate Manager, 36 Manchester Road, East Aurora, New York 14052. Please allow from two to four weeks for mailing of the certificates or endorsements.

HONG KONG AWARDS

HARTS meets every Tuesday at 1700 local, excluding public holidays, at the China Fleet Club, Arsenal Street, Wanchai, Hong Kong Island.

Nine Dragons Award

This award is given for one contact with a country in each of the following 9 zones: 18, 19, and 24 to 30. Contact for zone 24 must be a VS6. Stations within the 9 zones require 2 contacts in each zone, with 2 VS6 contacts. Only contacts after January 1, 1979, are valid. Fees are US $3, Australia $3, 1 pound 50 pence England postal order, or 24 IRCs.

Firecracker Award

This award is given for six contacts with different VS6 stations. Stations in zones 18, 19, and 24 to 28 require 10 contacts with different VS6 stations. Only contacts after January 1, 1964, are valid. Fees are US $2, Australia $2, 1 pound England postal order, or 10 IRCs.

Usual Conditions

Certified log extracts only—no QSL cards are required. Payment to be made in cash—no bank drafts. Postal orders to be left blank. Claims to: Awards Manager, HARTS, GPO Box 541, Hong Kong.

FCC

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FEDERAL COMMUNICATIONS COMMISSION

47 CFR Parts 1 and 97

[PR Docket No. 83-27; RM-4229; FCC 84-324]

Use of Volunteers To Prepare and Administer Operator Examinations in the Amateur Radio Service

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: This document amends the FCC rules regarding the preparation and administration of amateur radio operator examinations above the Novice Class to permit Volunteer-Examiner Coordinators (VEC's) and volunteer examiners to design the examinations instead of the FCC. This amendment will relieve the FCC of the administrative burden of designing the examinations and permit VEC's and examiners more latitude in preparing and administering examinations. This document also amends certain other FCC rules regarding the Amateur Radio Service volunteer examiner program to clarify them.

EFFECTIVE DATE: August 31, 1984.

FOR FURTHER INFORMATION CONTACT: John J. Borkowski, Private Radio Bureau, Washington, D.C. 20554, (202) 632-4964.

Appendix

Parts 1 and 97 of the Commission's Rules (47 CFR Parts 1 and 97) are amended as follows:

PART 1—[AMENDED]

1. Paragraph (e) of § 1.925 is revised to read:

§ 1.925 Application for special temporary authorization, temporary permit or temporary operating authority.

* * * * *

(e) Unless the FCC otherwise prescribes, an applicant already licensed in the Amateur Radio Service, upon successfully completing the amateur radio operator examination(s) required for a higher class, may operate his/her amateur radio station consistent with the rights and privileges of that higher class for a period of one year from the date of the most recently completed examination(s) for that operator class in accord with the provisions of § 97.35.

PART 97—[AMENDED]

2. The Table of Contents for Part 97 is amended as follows:

a. The heading of § 97.517 is revised to read "Examinations."

b. The heading of § 97.523 is removed.

3. Paragraphs (a), (b), and (d) of § 97.27 are revised to read:

§ 97.27 Examination preparation.

(a) Element 1(A) shall be prepared by the examiner. The preparer must hold an Amateur Extra, Advanced or General Class operator license. The test shall be such as to prove the applicant's ability to transmit correctly by hand (key, straight key, or, if supplied by the applicant, any other type of hand operated key such as a semi-automatic or electronic key, but not a keyboard keyer) and to receive correctly by ear texts in the international Morse code at a rate of not less than five (5) words per minute during a five-minute test period. Special procedures may be employed in cases of physical disability. (See § 97.26(g).) The applicant is responsible for knowing and may be tested upon the twenty-six letters of the alphabet, the numerals 0–9, the period, the comma, the question mark, $\overline{\text{AR}}$, $\overline{\text{SK}}$, $\overline{\text{BT}}$, and $\overline{\text{DN}}$. (See § 97.29(c).)

(b) Elements 1(B) and 1(c) shall be prepared by the examiners or be obtained by the examiners from the VEC. The preparer must hold an Amateur Extra Class license. The test shall be such as to prove the applicant's ability to transmit correctly by hand (key, straight key, or, if supplied by the applicant, any other type of hand operated key such as a semi-automatic or electronic key, but not a keyboard keyer) and to receive correctly by ear texts in the international Morse code at not less than the prescribed speed during a five-minute test period. Special procedures may be employed in cases of physical disability. (See § 97.26(g).) The applicant is responsible for knowing and

may be tested upon the twenty-six letters of the alphabet, the numerals 0–9, the period, the comma, the question mark, AR, SK, BT and DN. (See § 97.29(c).)

• • • • •

(d) Elements 3, 4(A) and 4(B) will be designed by the VEC. The VEC will select questions for each test from the appropriate list of questions approved by the Commission (either PR Bulletin 1035 B, C or D, latest date of issue). The VEC must select the appropriate number of questions from each category of the syllabus (PR Bulletin 1035) as specified in PR Bulletin 1035 B, C or D. These questions must be taken verbatim from the appropriate PR Bulletin in the form in which they have been approved by the Commission. Beginning January 1, 1987, volunteer examiners may also design Elements 3, 4(A) and 4(B) in accord with the provisions of this paragraph. Each VEC and each volunteer examiner is required to hold current examination designs in confidence.

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4. Paragraphs (a) and (e) of § 97.28 are revised to read:

§ 97.28 Examination administration.

(a) Unless otherwise prescribed by the Commission, each examination for an amateur radio operator license (except the Novice Class operator license) shall be administered by three accredited (see § 97.515) volunteer examiners. An examiner administering telegraphy examination element 1(A) or written examination element 2 (in conjunction with an examination other than a Novice Class examination) or written examination element 3 must hold an Amateur Extra Class or Advanced Class radio operator license. An examiner administering telegraphy examination element 1(B) or 1(C) or written examination element 4(A) or 4(B) must hold an Amateur Extra Class radio operator license.

• • • • •

(e) When the candidate scores a passing grade on an examination element, the examiners (except for examinations for the Novice Class operator license) must issue a certificate of successful completion of the examination. This certificate may be used for a period of one year for examination credit for telegraphy elements 1(A), 1(B) or 1(C). (See § 97.25(b).)

• • • • •

5. Paragraph (b) of § 97.31 is revised to read:

§ 97.31 Volunteer examiner requirements.

• • • • •

(b) Any person who owns a significant interest in, or is an employee of, any company or other entity which is engaged in the manufacture or distribution of equipment used in connection with amateur radio transmissions, or in the preparation or distribution of any publication used in preparation for obtaining amateur station operator licenses, is ineligible to be a volunteer examiner for purposes of administering an amateur radio operator examination. However, a person who does not normally communicate with that part of an entity engaged in the manufacture or distribution of such equipment, or in the preparation or distribution of any publication used in preparation for obtaining amateur operator licenses, is eligible to be a volunteer examiner.

• • • • •

6. Section 97.35 is revised to read:

§ 97.35 Temporary operating authority.

Unless the FCC otherwise prescribes an applicant already licensed in the Amateur Radio Service, upon successfully completing the amateur radio examination(s) required for a higher class, may operate an amateur radio station consistent with the rights and provileges of that higher class for a period of one year from the date of the most recently completed examination for that operator class provided that the applicant retains the certificate(s) for successful completion of the examination(s) (see § 97.28(e)) at the station location, provided that the applicant uses the identifier code of the new class of license for which the applicant has qualified (KT for Technician Class, AG for General Class, AA for Advanced Class and AE for Amateur Extra Class) as a suffix to the present call sign (see § 97.84), and provided that the FCC has not yet acted upon the application for a higher class of license.

7. Paragraph (f) of § 97.84 is revised to read:

§ 97.84 Station identification.

• • • • •

(f) When operating under the temporary operating authority permitted by § 97.35 with privileges which exceed the privileges for the class of operator license currently held by the licensee, a licensee must identify in the following manner:

(1) On radiotelephony, by the transmission of the station call sign, followed by the word "temporary", followed by the identifier code for the new class of license for which the licensee has qualified (see § 97.35).

(2) On radiotelegraphy, by the transmission of the station call sign, followed by the fraction bar DN, followed by the identifier code for the new class of license for which the licensee has qualified (see § 97.35).

• • • • •

8. Paragraph (a) of § 97.503 is revised to read:

§ 97.503 Definitions.

• • • • •

(a) *Volunteer-examiner coordinator* (VEC). An organization which has entered into an agreement with the Federal Communications Commission to coordinate the efforts of volunteer examiners in preparing and administering examinations for amateur radio operator license.

• • • • •

9. Section 97.505 is revised to read:

§ 97.505 Applicability of rules.

These rules apply to each organization that serves as a volunteer-examiner coordinator.

10. Section 97.509 is revised to read:

§ 97.509 Conflicts of interest.

An organization engaged in the manufacture or distribution of equipment used in connection with amateur radio transmissions, or in the preparation or distribution of any publication used in preparation for obtaining amateur radio station operator licenses may be a VEC only upon a persuasive showing to the Commission that preventative measures have been taken to preclude any possible conflict of interest.

11. Section 97.511 is revised to read:

§ 97.511 Agreement required.

No organization may serve as a VEC until that organization has entered into a written agreement with the Federal Communications Commission to do so. The VEC must abide by the terms of the agreement.

12. Section 97.517 is revised to read:

§ 97.517 **Examinations.**

A VEC will design (see § 97.27(d)), assemble, print and distribute written examination Elements 3, 4(A) and 4(B). A VEC may design, assemble, print and distribute examination Elements 1(B) and 1(C). A VEC is required to hold examination designs in confidence.

§ 97.523 **[Removed]**

13. Section 97.523 is removed and reserved.

47 CFR Part 97

[PR Docket No. 82-83; RM Nos. 3705, 3729, 3734, 3778, 3831, 3833, 3880; FCC 84-345]

Radiotelephony Expansion High Frequency Amateur Bands; RM-4228 Petition for Telephony Operations on Frequencies Between 7075-7100 kHz in Hawaii and in Areas Near Region 3

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: This document amends the rules by expanding telephony privileges on frequencies 3750-4000 kHz, 21200-21450 kHz, 28300-29700 kHz, and 7075-7100 kHz (Hawaii and in areas near Region 3). These amendments are necessary so that amateur radio operators will have additional radiotelephone frequencies on which to operate. The result of this action is to relieve the overcrowding on the presently-allocated frequencies for radiotelephony in the Amateur Radio Service.

EFFECTIVE DATE: 0001, Universal Coordinated Time (UTC), September 1, 1984.

ADDRESS: Federal Communications Commission, Washington, D.C. 20554.

FOR INFORMATION CONTACT: Maurice J. DePont, Private Radio Bureau, Washington, D.C. 20554, (202) 632-4964.

Appendix

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended, as follows:

1. Section 97.7(a) is revised as follows:

§ 97.7 **Privileges of operator licenses.**

(a) Amateur Extra and Advanced Class. All authorized amateur privileges including exclusive frequency operating authority in accordance with the following table:

Frequencies	Class of license authorized
3500-3525 kHz	Amateur extra only.
3750-3775 kHz	Do.
7000-7025 kHz	Do.
14,000-14,025 kHz	Do.
14,150-14,175 kHz	Do.
21,000-21,025 kHz	Do.
21,200-21,225 kHz	Do.
3775-3850 kHz	Amateur extra and advanced.
7150-7225 kHz	Do.
14,175-14,225 kHz	Do.
21,225-21,300 kHz	Do.

2. In § 97.61(a), that portion of the table under the heading "kHz" is revised to read as follows. The entries in the table under the headings "MHz" and "GHz" remain the same.

§ 97.61 **Authorized frequencies and emissions.**

(a) * * *

Frequency band	Emissions	Limitations (see paragraph (b))
Kilohertz		
1800 to 2000	A1, A3	
3500 to 4000	A1	
3500 to 3750	F1	
3750 to 4000	A3, A4, A5, F3, F4, F5	4
4383.8	A3A, A3J	13
7000 to 7300	A1	3, 4
7000 to 7150	F1	3, 4
7075 to 7100	A3, F3	11
7150 to 7300	A3, A4, A5, F3, F4, F5	3, 4
14000 to 14350	A1	
14000 to 14150	F1	
14150 to 14350	A3, A4, A5, F3, F4, F5	
21000 to 21450	A1	
21000 to 21200	F1	
21200 to 21450	A3, A4, A5, F3, F4, F5	
28000 to 29700	A1	
28000 to 28300	F1	
28300 to 29700	A3, A4, A5, F3, F4, F5	

3. Secton 97.81(b) (11) is revised to read as follows:

§ 97.61 **Authorized frequencies and emissions.**

* * * * *

(b) * * *

(11) The use of A3 and F3 in this band is limited to amateur radio stations located outside Region 2 and amateur radio stations located within Region 2 which are west of 130 degrees West longitude.

* * * * *

47 CFR Part 97

[PR Docket No. 84-288; FCC 84-322]

Reimbursement of Out-of-Pocket Costs for Volunteer Administered Amateur Radio Examinations

AGENCY: Federal Communications Commission.

ACTION: Final rule.

SUMMARY: This document amends the rules to provide for reimbursement of out-of-pocket costs incurred by volunteer examiners and volunteer examiner coordinators in connection with administering or coordinating amateur operator license examinations. The rules are necessary so that the volunteers can recover their prudently-incurred expenditures. The effect of this action is to establish regulations which permit reimbursement to volunteers for their necessary expenses.

EFFECTIVE DATE: August 31, 1984.

ADDRESS: Federal Communications Commission, Washington, D.C. 20554.

FOR FURTHER INFORMATION CONTACT: Maurice J. DePont, Private Radio Bureau, Washington, D.C. 20554, (202) 632-4964.

Appendix

Part 97 of Chapter I of Title 47 of the Code of Federal Regulations is amended as follows:

See List of Advertisers on page 98

* * * * *

1. Section 97.31(c) is revised to read as follows:

§ 97.31 Volunteer examiner requirements.

* * * * *

(c) Volunteer examiners may not be compensated for services. They may be reimbursed for out-of-pocket expenses, except for Novice class examinations (see § 97.36).

* * * * *

2. Section 97.33 is revised to read as follows:

§ 97.33 Volunteer examiner conduct.

No volunteer examiner shall give or certify any examination by fraudulent means or for monetary or other consideration. Violation of this provision may result in the revocation of the amateur radio station license and the suspension of the amateur radio operator license of the volunteer examiner. This does not preclude a volunteer examiner from accepting reimbursement for out-of-pocket expenses under § 97.36. Reimbursement in any amount in excess of that permitted may result in the sanctions specified herein.

3. New § 97.36 is added as follows:

§97.36 Reimbursement for expenses.

(a) Each volunteer examiner coordinator and each volunteer examiner may be reimbursed by examinees for out-of-pocket expenses incurred in preparing, processing or administering examinations for amateur station operator licenses above the Novice class. The volunteer examiner coordinator or the volunteer examiners must collect the reimbursement fee, if any, from the examinees. No reimbursement may be accepted for preparing, processing or administering Novice class examinations.

(b) The maximum amount of reimbursement is $4.00 for 1984 and will be adjusted annually each January 1 thereafter for changes in the Department of Labor Consumer Price Index. Changes in the maximum amount of reimbursement will be announced by the Commission in a Public Notice. The amount of such reimbursement fee from any examinee for any one examination at a particular session regardless of the number or examination elements taken must not exceed the published maximum.

(c) Each volunteer examiner coordinator and each volunteer examiner who accepts reimbursement must maintain records of out-of-pocket expenses and reimbursements for each examination session. They must certify on or before January 31 of each year to the Commission's office in Gettysburg, PA 17325 that all expenses for the period from January 1 to December 31 of the preceding year for which reimbursement was obtained were necessarily and prudently incurred.

(d) The expense and reimbursement records must be retained by each volunteer examiner coordinator and each volunteer examiner for 3 years and made available to the FCC upon request.

(e) Each volunteer examiner must forward on or before January 15 of each year the certification concerning expenses to the volunteer examiner coordinator who coordinated the efforts of the volunteer examiner and for which reimbursement was received. The volunteer examiner coordinator must forward all such certifications and its own certification concerning expenses to the FCC on or before January 31 of each year.

(f) The volunteer examiner coodinator must disaccredit any volunteer examiner who fails to provide the annual certification. The volunteer examiner coordinator must advise the FCC on January 31 of each year of the volunteer examiners that it has disaccredited for this reason.

4. Section 97.507(e) is revised to read as follows:

§ 97.507 VEC qualifications.

* * * * *

(e) Agree not to accept any compensation from any source for its services as a VEC, except reimbursement for out-of-pocket expenses permitted by § 97.36; and

* * * * *

5. The introductory text preceding paragraph (a) in § 97.515 is revised to read as follows:

§ 97.515 Coordinating volunteer examiners.

A VEC will accredit amateur radio operators licensed by the Federal Communications Commission as volunteer examiners (see § 97.30). A VEC will seek to recruit a broad representation of amateur radio operators to be volunteer examiners. A VEC may not discriminate in accrediting volunteer examiners on the basis of race, sex, religion or national origin. A VEC may not refuse to accredit volunteer examiners on the basis of membership (or lack thereof) in an amateur radio organization. A VEC may not discriminate in accrediting volunteer examiners based upon their accepting or declining to accept reimbursement. A VEC must not accredit an amateur radio operator volunteering to be an examiner if:

* * * * *

HAM HELP

I need a manual and plug-in memory modules for a Memory-Matic 8000 keyer by Data Engineering, Inc.

K. D. Benton K4FHQ
333 Crossbill Lane
Warrior AL 35180

I'd like information on interfacing a Motorola speaker/mike to a Yaesu FT-208R. I have it hooked up but the speaker/mike overheats.

Art Oates K9GBN
122 Arrow Drive
Pekin IL 61554

Help! Where can I get a 10m SSB conversion kit for my Sears 663-3810.0050 CB transceiver before I go back to Europe?

Klaus Stichternath N2EHQ
68 Mandalay Drive
Poughkeepsie NY 12603

I am interested in starting a club for overseas American hams. This would include publishing a newsletter for the members to exchange ideas, equipment, and information, running a weekly net, helping individuals get licensed in some countries, and assisting individuals in getting equipment air-shipped to remote locations. If you are interested in forming such a club, please contact me at the following address.

Charles E. Martin AB4Y
AmEmbassy MAPUTO
Dept. of State
Washington DC 20520

I need to know where I can buy parts and have a high-voltage transformer repaired for a General Electric television, model 810. I also need a schematic for a Grundig Universal Music-Boy, model K-74.

William Deramo
51 Suffolk Ave.
Revere MA 02151

I am trying to locate Advanced Communications International, a manufacturer of watches, whose last current address was 2411 Lincoln Avenue, Belmont CA 94002. If this company is still in business, I would like their new address.

Ernesto Hormillosa
Det. 5 AFSCF (116)
APO San Francisco 96334

SATELLITES

USING THE AO-10 APOGEE PREDICTIONS

Apogee predictions for the month of October are provided for three sections of the United States: Washington DC at 39N 77W, Kansas at 39N 95W, and California at 38N 122W. Times are in UTC and apogee in this case is mean anomaly 128 rounded to the nearest whole hour. Use the chart as a guide in aiming your antenna, then fine-tune the azimuth and elevation values to peak the satellite's beacon signal. If you require more accurate orbital predictions, contact AMSAT at PO Box 27, Washington DC 20044.

AMSAT ANNUAL MEETING

The yearly AMSAT technical symposium and general-membership meeting is slated for Saturday, November 10 at the Amfac (formerly Airport Marina) Hotel on the north side of Los Angeles International Airport. A block of convention-rate rooms has been set aside—for reservations, contact the hotel at (213)-670-8111.

Technical presentations on present and future amateur-satellite projects will be given during the morning and afternoon sessions. The general-membership meeting will be held in the evening following a banquet dinner. For detailed conference information and registration, send an SASE to Dennis Dinga N6DD, PO Box 4111, Diamond Bar CA 91765.

Thanks to Amateur Satellite Report *for this month's news.*

AMSAT-OSCAR 10 APOGEE PREDICTIONS
OCTOBER 1984

			WASH		KANSAS		CALIF	
ORBIT	DAY	TIME	AZ	EL	AZ	EL	AZ	EL
1309	1	0800			184	10	269	32
1310	1	2200	96	17	84	3		
1311	2	0700			280	11	264	33
1312	2	2000	81	8				
1313	3	0700	285	3	274	17	257	40
1315	4	0600	279	12	268	27	247	50
1317	5	0600	274	16	262	30	238	53
1319	6	0500	263	25	254	40	222	61
1321	7	0400	261	35	245	50	196	67
1323	8	0400	254	38	235	53	180	66
1325	9	0300	244	48	218	61	151	64
1327	10	0200	231	57	193	66	128	58
1329	11	0100	211	65	162	67	113	50
1331	12	0100	195	64	150	62	110	44
1333	13	0000	166	66	129	57	100	35
1335	13	2300	140	62	114	49	91	26
1337	14	2300	132	56	111	43	90	20
1339	15	2200	116	49	100	34	82	12
1341	16	2100	105	40	92	25	75	3
1343	17	2100	103	34	90	19		
1344	18	0800					278	13
1345	18	2000	101	28	82	11		
1346	19	0800					272	16
1347	19	1900	86	17	75	3		
1348	20	0700			282	4	266	26
1349	20	1900	84	11				
1350	21	0600	287	0	276	14	259	36
1351	21	1800	77	3				
1352	22	0600	282	3	271	17	252	39
1354	23	0500	276	12	265	27	243	49
1356	24	0400	270	22	257	37	229	58
1358	25	0400	264	25	250	40	216	60
1360	26	0300	257	35	240	49	191	65
1362	27	0200	248	44	225	58	162	65
1364	28	0200	240	47	213	59	151	61
1366	29	0100	226	56	189	63	130	55
1368	30	0000	205	62	161	63	115	47
1370	30	2300	178	66	136	59	103	39
1372	31	2300	165	62	130	53	101	33

RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
6 Jenny Lane
Pikesville MD 21208

Let's plunge into some questions this month, which I think are broad enough to apply to a good many of us involved in RTTY.

Rick Thomas of Okemos, Michigan, asks about the use of optoisolators to pick off a signal from a RTTY loop (hmm...nice phrase) for inputting to a computer. Well, Rick, the use of isolating devices between a teleprinter loop, typically running 150 to 300 volts at 60 mA, and the sensitive input of a computer is a very good idea. As you suggest in your letter, optoisolators are one such device which can be used. Fig. 1 is a simple scheme to pick the signal off a loop and output the data through an optoisolator. One feature of this scheme is the use of a bridge rectifier to extract the signal from the loop, thus making the circuit immune to the polarity of the loop.

Another way to derive the RTTY signal but remain isolated electrically from the loop is with the use of a magnetic reed relay. Fig. 2 is a way to interface a reed relay into a loop. In this case, the current limiting on the loop should keep the relay coil from burning out despite being supplied more voltage than is normally used. I would use this type of a circuit if I had to key another loop that didn't use TTL voltage levels.

Rick also expresses concern over lightning-induced voltage transients getting into his loop or equipment. Well, you might take a look at a new little wonder, the metal-oxide varistor. These MOVs look like a disc capacitor but are truly little MORvels, pardon the pun. Radio Shack carries two versions: The V8ZA1 (276-569) protects digital and linear circuits operating at five volts and below, and the V130LA10A (276-570) is for line-operated equipment. Fig. 3 is a simple diagram of how to hook one of these up to a piece of line-operated equipment. It should be relatively easy to adapt this to whatever you like.

Here's a note from Harvey Wenzel KA8CUB in Brunswick, Ohio. Harvey has just gotten hold of a Model 33 ASR Teletype® machine and would like to hook it up. Way to go, Harvey! Unfortunately, a lot depends on just what "guts" your machine has, as different call-control units, that's the circuitry in the panel on the right, require different hookups. However, here's something to gel you started. Look inside of your machine for a nine-conductor screw-type terminal strip. It should be near the back and, if you're lucky, labeled 151411. Now, look at Fig. 4 and try to use these hookups to run your printer and keyboard. Good luck, and if you can determine the exact call-control unit or send me whatever information you can derive, I will see if I can help out.

For years we called them either terminal units or demodulators. Now, they are marketed as receiving interfaces. Still the same thing, folks. That's why this note, from Kris Cena in Hamilton, Ontario, rings a bell. Kris would like to know what the best interface is to go between a receiver and his microcomputer. Kris, you don't want to know what the best interface is because, as the saying goes, if you have to ask, you can't afford it. The bottom line is that about any terminal unit will do just fine, not necessarily one that is directed at the computer crowd. If you are lucky, a pass or two at hamfest tables may turn up just what you need. The essentials should be a stable, preferably fairly-modern unit that is capable of putting out a TTL-level signal. Of course, you could always use one of the isolation circuits from above to adapt a "loop only" bargain. Any of them should work just fine.

Kaypro owners, listen up! We said a few months back that I had seen nothing for that machine. Well, I still haven't but Tyler Parsons WB7DDL says that he has something for you. Tyler is running a RTTY terminal program, written in Pascal, on his Kaypro II. He is offering the program at $29.95, including the program and instructions on disk. He also indicates that he would consider adapting the program for the Kaypro 4 if there is sufficient interest. Write him for more information at 1915 S.E. Stone Street, Corvallis, Oregon 97333, and tell him you are interested in the Kaypro RTTY program mentioned in "RTTY Loop."

Another new member of the club is Harry J. Przekop, Jr. WB9EDP near Chicago, Illinois. Harry is interested in talking to other users of the Drake Theta 7000E communications terminal. Sorry to say, Harry, I have no personal information on this terminal. As I mentioned last month, what information I get, I print. If the manufacturers are interested, I am available. Anyway, if you want to share your experiences with Harry, drop him a line at 332 S. Cuyler, Oak Park, Illinois 60302. Send me a copy, too, and I will share the information with the multitudes!

To those who have written asking where the printouts of the winners of this year's SCATS RTTY art contest are—they didn't send them to me this year. Sorry. Maybe next time?

A letter from Ray Smalley NB2W in South River NJ has me a bit confused. Ray relates that he is "trying to use Clay Abrams' NEWRTTY program on the CoCo* but would like to use the RS-232 port instead of the ROM port." Ray, let's define a few terms, then look at the program. On the back of the CoCo is a four-pin DIN connector, commonly called the RS-232 port. This serial port is not a true, hardware, serial port, but rather a "bit banger" which uses one bit of a parallel port for input, one bit for output, and a software serial-input routine. In some respects, this resembles the RTTY program for the 6800 published here about six or seven years ago. Now, on the side of the CoCo behind a spring-loaded door is an edge connector, commonly called the ROM port. This is, in fact, an extension of the CoCo's address and data bus. Several manufacturers take advantage of this fact by building short extension buses, kind of mini mother boards, which allow several ROMpack-type devices to be plugged in at once.

Now, with that said, let's look at NEWRTTY. This program sends RTTY data out and receives demodulated RTTY data in through the bit-banger RS-232 port. The software driving the port has been changed so that instead of expecting ASCII, it expects Murray and does the necessary conversion before presenting the data to you. So, as you can see, the standard RS-232 port is all you need use with this program; you need never touch the ROM port. Perhaps someday Clay will come up with a disk version of the program, and that ROM port will be needed to run the disk. Hope this clears things up a bit.

Okay east coasters, here we go inundating another amateur. Lowell F. Lind K4AWQ is willing to give away a Model 28 ASR. If it has not been grabbed up by the time this sees print, you might want to drop him a note at 1308 N. Tuckahoe Street, Falls Church, Virginia 22046. Remember that this column is written in July and published in late September if it's gone when you try. No guarantees, I just pass along what I get.

Thanks for the interesting comments and kudos from some more of our readers: Glenn Perry W7RJD, in Mountain Home, Idaho; John A. Kiefer KA6SHT, in Sunnyvale, California; John Sater W3LJW, Union Bridge, Maryland; Alfred Forte III WD4PQN, Ocala, Florida; and Tom Glaza KC8AE, in Filion, Michigan. I appreciate all of your comments and suggestions and shall try to include some of them in future columns.

Quite a potpourri this month. Don't you love the suspense to see what comes next month? Be sure your subscription is current so you won't miss anything in "RTTY Loop."

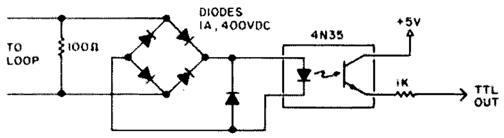


Fig. 1. Using an optoisolator in the loop.

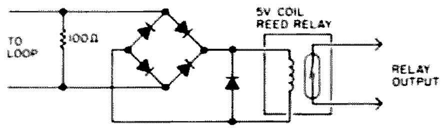


Fig. 2. Using a reed relay in the loop.

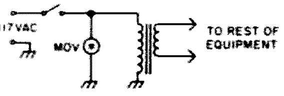


Fig. 3. Connecting an MOV across the line.

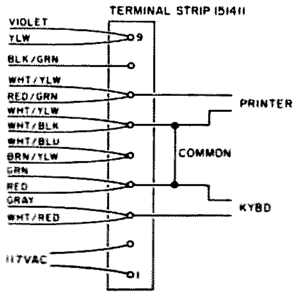


Fig. 4. Terminal strip in a Model 33.

REVIEW

TEN-TEC MODEL 4229 ANTENNA TUNER

Awhile back, I saw advertised in *73* the Ten-Tec Model 4229 Antenna Tuner kit (Photo A). After some plain and fancy dancing, I managed to snare the checkbook away from the XYL to order it. As I am a rather new ham, she didn't realize the tradition-setting this order entailed.

Despite the slowness of the military mail system, in about three weeks a large box arrived from Sevierville, Tennessee. Only three weeks to get an order from the United States to Guantanamo Bay, Cuba, can be likened to same-day service.

Fortunately, I did not have duty the weekend the kit arrived. So, clearing a space at the dining room table, I carefully opened the box and began. Oops! Look at all those parts! This is a lot different from the few Heathkits® I've assembled in the past. Instant doubt. Did my ambition overload my ability? Did I bite off more than I could chew? (Gasp) Do I need to roust out my Elmer and admit I need help? Tune in tomorrow for the next episode in the exciting adventures of a new ham.

On closer reading of the instruction manual and a calming cup of coffee, I decided to go on until I got stuck and only then yelp for help. The assembly instructions included with the kit said average assembly time was about eight hours. Not being as experienced, knowledgeable, and skillful as the average kit builder, and since I have always relied heavily on the blow-up drawings and pictures in the Heathkit manuals, it took me about 18 hours to complete the kit. Granted, some of this 18 hours involved finding the silly mistakes I'd made and the time it took to regroup. It was my several errors and not the fault of Ten-Tec or the manual.

The roller inductor is pre-wound and formed when the kit arrives. The variable capacitor is the kit builder's assembly project (Photo B). All those stator and rotator plates and spacers! Do NOT lose a spacer! The remainder of the kit's assembly is straightforward. The assembly instructions are more or less divided into sections. Read each section thoroughly before starting. Work slowly and carefully.

Yes, a Novice and a novice kit builder can, with a little thought and a lot of care, assemble this tuner without too much trouble and without the assistance of an Elmer. It may take longer than the eight-hour average of the more experienced

builder, but the results are well worth the time.

Technical Data

The Ten-Tec Model 4229 is an adjustable reactive network used for matching the unbalanced 50-Ohm output of a transmitter to a variety of loads, either balanced or unbalanced. It covers a frequency of 1.8 to 30 MHz, with a dual-range power and swr meter included. Provision is made for selecting between four antennas (Photo C), one of which may be either *longwire*, balanced line, or for bypassing the matching network.

The circuit is a modified L network with an 18-uH silver-plated roller inductor capable of handling 2 kW of rf power. The capacitor voltage rating is 3.5 kV, and the matching-output range is at least 10:1 swr, any phase angle, 1.8 to 30 MHz.

The assembly instructions are well thought out. All of the problems I encountered were because I was careless in reading instructions, I tried to hurry, or I did not pay close attention to what I was doing. Granted the Ten-Tec manual does not have all the pictures and drawings of a Heathkit, but even a kit builder with minimal expertise can assemble a good-looking, functional antenna tuner.

Great, you are saying. This Novice has been rambling on about the assembly manual and how to put it together, but how about after the kit is complete? Then what?

Glad you asked. This is my first experience with Ten-Tec. The operator's manual is well written, nicely laid out, and tells you everything you might need to know about the tuner, the circuits, adjusting the swr/power meter—if it ever needs adjusting—and how and why the tuner works. After talking with other hams at Guantanamo Bay, I found out that the operator's manual is standard Ten-Tec—in other words, high quality.

Unplanned Benefit

An unexpected bonus of using the tuner was that it showed that my ground installation needed work. The ground system I had was not as good as it should have been, which caused arcing between two terminals on the roller assembly. The grounding system adopted consists of a 1k-uF capacitor soldered between the center lead and shield on each end of coax long enough to connect radios, tuners, etc., with a good outside earth ground (see back issues of *73* for details). This solved the arcing problem I had experienced. Properly grounded, the tuner loads nearly everything, and very nicely, too.

Final Remarks

If you already own a "Super Whiz-Bang Automatic Antenna Tuner/Dog Walker/Coffee Maker Deluxe," the Ten-Tec Model 4229 Antenna Tuner kit would make an excellent spare for use during Field Day or emergencies. If you don't own a Super Whiz Bang, etc., and you want a good-looking, functional antenna tuner that you can assemble yourself without the hassles of scrounging parts and without a wallet-smashing cash outlay, try the American-made Ten-Tec Model 4229 Antenna Tuner kit.

Thanks for the photographic processing go to John Howard, President of the GTMO Reflex Photo Club, Guantanamo Bay; thanks also to my Elmer, Tim Miller WB0RXX/KG4TM, who was never too busy to answer my dumb questions.

For more information, contact *Ten-Tec, Inc., Sevierville TN 37862.*

James Sackey KA2SHH/9
Great Lakes IL

DOCTOR DX FROM AEA

It was Saturday morning, and the *CQ WW DX* Contest was in full swing. As my wife walked past the shack, she voiced her *familiar "Are you going to be on that* radio all weekend?" complaint. Moments later she remembered that I didn't have an antenna up! Obviously something strange was going on, for the sound of a raging contest was pouring out of the station speaker even though the rig was turned off!

I've been blessed with an understanding mate. I explained that, yes, I would be contesting all day Saturday, and no, I wasn't planning to use a radio—in fact, all of the hams I had been talking with were random bits inside a computer's brain. This, of course, confirmed her earlier assessment of my mental faculties.

Eight hours later I had worked 541 stations in 105 countries and had amassed a total score of 641,125 points. Without a radio.

This was my introduction to Doctor DX, the latest product from AEA. Doctor DX is a contest simulator. It's designed for the Commodore 64 and requires only an external CW key to operate. And I do mean operate!

After plugging the board into the back of your C-64 and powering up, a sleek transceiver is displayed on the screen. The rig features full ham-band coverage (10-160 meters), variable power output, and a digital frequency display. A volume control and bandpass filter are also included. After setting the real-time clock and defining your station's location (more about this in a moment), you are plunged into the incredible world of computer simulation.

The contest is recreated in intricate detail. As in real life, you have the option to either sit on a frequency and call CQ or hunt-and-pounce. In both instances, stations will interact with you during the course of an exchange. Here's an example, where ON7TC is calling CQ on 14.028 MHz:

ON7TC: CQ TEST DE ON7TC K
KK2Y: TC DE KK2Y
ON7TC: KK2Y ??? 14(I missed the report)
KK2Y: RST?
ON7TC: 579 579 BK
KK2Y: R 5NN 05 GL
ON7TC: QSL TU QRZ DE ON7TC

Note that the simulated station responded to my query. Stations will also honor requests to QRS or QRQ and will repeat any part of the exchange that you happen to miss. They will occasionally ask you for a repeat when QRM is heavy or you are sending too fast.

Tuning up and down the band is accomplished by pressing one of four keys on the C-64. The higher end of each band is occupied by slow, inefficient stations. Dropping into the Extra-class segment will allow you to contact super-stations running 30-40 wpm. No sloppy fists here—everyone sends computer-generated code!

Earlier I mentioned the real-time clock. The program uses the time of day and your location in a propagation model that creates the conditions you might expect to hear on the bands. For example, I worked ZL and VK stations on 10 meters early in the morning, and later that afternoon moved to 15 meters, which was open to Europe. During the daylight hours, 80 and 160 meters yielded nothing but static, but excellent DX openings occurred on both of these bands after local sunset. Of course 20 meters was crowded with stateside big guns endlessly pounding out "CQ DX". The model seems to be very realistic and can be verified by comparing Doctor DX's band conditions with the real thing.

Possibly one of the most exciting aspects of Doctor DX is the ability to operate from any location on Earth. As mentioned above, the propagation model uses both time and location to create band conditions. You have the option to define any location you wish by supplying Doctor DX with the appropriate latitude and longitude.

Ever wonder what it's like to live in Burma? Key in 17N, 96E and you are there, experiencing conditions just as they would be if you made the trip. Like to activate Albania? Try 41N, 20E and work the pileups! I took a trip to the Sudan and worked scores of VUs on 160 meters!

Photo. A. Front view of completed kit.

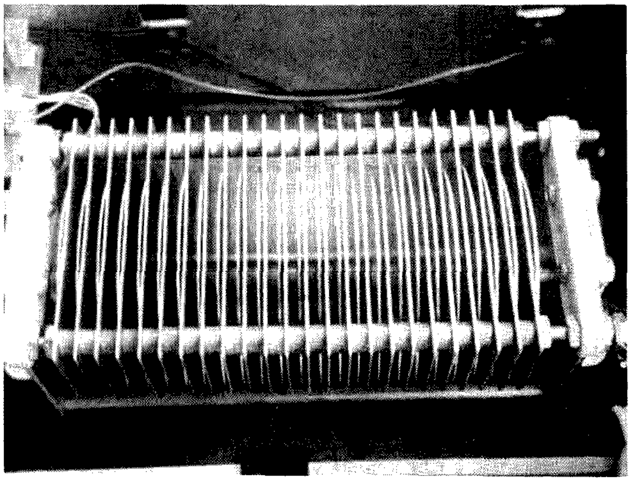


Photo B. Variable capacitor has many parts to assemble.

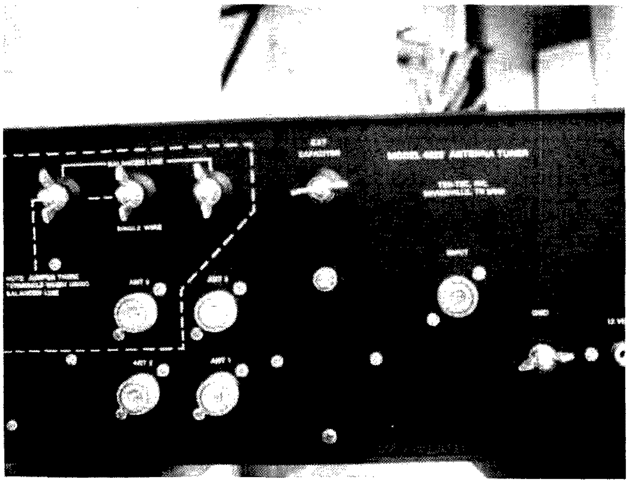


Photo C. Your choice of 3 coax-fed antennas and a longwire or balanced-line antenna.

On-screen scoring information is another outstanding feature. Doctor DX is, after all, a contest simulator/trainer. Complete statistics are displayed in real time and include countries/zones worked per band, aggregate countries/zones worked, number of QSOs, points, and total score. Your contact rate, in QSOs per hour, is also given as an indication of your relative skill—at one point I was clipping along at 136 QSOs per hour while working a string of JAs on 15 meters. This detailed information allows you to compare your operating skill with that of others and to measure the improvement in skill that comes with practice.

You may also use the scoring information to participate in the AEA awards program. As in the real world, you can earn AEA-CC for 100 DX countries worked, AEA-AZ for contacting all 40 zones, 5-band AEA-CC, or be admitted to the AEA Honor Roll for working 250 DX countries or more. A special coding system generates a checksum figure that verifies your achievement—no QSLs are required! In addition, AEA plans to publish a list of the high-scoring stations in their magazine ad each month.

This single program is incentive to buy a C-64. I know it's tough to believe that a piece of software could so realistically simulate amateur radio, but it does. You absolutely must hear it—a few times I caught myself reaching up for a knob to tweak!

I could talk myself blue trying to convince you that this product is the most exciting thing I've seen in my eleven years as a ham, but it isn't the same as experiencing it yourself. My final advice? Buy this program *now!*

For detailed information on Doctor DX, contact *Advanced Electronic Applications, PO Box C-2160, Lynwood WA 98036.*

Perry Donham KK2Y
***73* Staff**

BILAL ISOTRON 40

When the box arrived in my office last Wednesday, I remember thinking: "Even Ralph Bilal couldn't fit a 40-meter antenna into a package *only* 33" × 6½" × 3"...why, that's smaller than the boxes most model airplanes come in!"

Ralph had promised to send me the latest version of this Isotron 40, a small, versatile antenna designed for limited spaces such as apartments, condos, campers, and the like where it is almost impossible, for either legal or physical reasons, to put up a full-sized antenna. It's also recommended, from the standpoint of size alone, to serve as an emergency, mobile, or portable antenna that can be used in motel rooms, at a disaster site, or even bracketed to the bumper of an automobile.

"All well and good," I thought, "but does it work?"

Unpacking

On Friday, after work, I took the box out of the trunk of my car and carried it into the workshop, wondering if I'd be able to get it on the air before dark. When I opened the box, the first thing I noticed was the neat packaging job done by Bilal. There were two plastic bags containing hardware—good quality, plated hardware or aluminum hardware, depending on the use. I wondered if there was enough to go around; it has been my experience in the past to be shortchanged on nuts, bolts, and washers. But not this time, as you'll see.

Each component or group of components was neatly wrapped and protected with brown paper and packaging tape. There were four pre-drilled and bent aluminum plates, one with an SO-239 UHF connector and a small standoff insulator already mounted on it; there was a 31" length of clear plastic tubing, partly wound with #12 insulated wire, with a nice foot-long lead and terminal soldered in place, and a piece of clear plastic tubing about 20" long, pre-drilled with holes; there were a couple of pieces of Lucite® with holes in them, a piece of 1"-square aluminum tubing, and several other, smaller pieces that I couldn't immediately identify. Nothing elaborate or fancy, either—just plain vanilla—and good old-fashioned workmanship. I began to believe that when Ralph Bilal *told* you something, you had better believe it. My confidence was increasing by the moment.

Assembly

The instructions include diagrams, step-by-step assembly comments, and a final tune-up procedure. After reading and rereading the instructions (something I seldom do because the drawings are clear, but in this case the antenna components seemed so different in size and shape from anything I had ever seen before that I figured that I had better read them carefully), I began the assembly. Surprisingly, it went smoothly and without any problems at all: a new first for me! Everything fit into place and all the holes lined up perfectly with no bending, binding, or mismatches anywhere.

Good heavens! So that's what this thing looks like! (See photo.) I couldn't imagine anything that ever looked less like an antenna! Oh, well, Ralph has been at this for over five years, so I had better trust him. He knows more about *this thing* than I do.

The "far" ends of the parallel rods were pre-drilled to accept typical TV-mounting hardware, and the hardware itself was included: U-bolts, washers, nuts, and plates of good, plated quality. Even the plastic bar had a dowel inserted in one end for reinforcement—the result of experience and cut-and-try engineering.

The instructions suggested mounting the antenna on a short length of 1¼"-diameter TV-mast tubing, and I just happened to have a five-foot length in the garage. I mounted the Isotron "antenna" to the TV mast with the help of my XYL who held things straight while I tightened the clamps. After all was square and aligned, I *did the final tightening of the hex nuts,* and there it was! Clearly, something different.

The weight was negligible and the wind loading laughable. Gosh, this thing could fit on top of almost any chimney bracket, on a mast alongside a trailer, or *even in* the shack in the middle of the floor! Yep, that's what I did. I happened to have a military-surplus wooden tripod that had been used to mount a transit. The short length of TV mast exactly fit into the central collar, so I set it up in the shack (read spare bedroom) between the beds. A ten-foot piece of RG-8/U was enough to reach the operating desk and B&W coaxial switch mounted there.

Tune-Up and Operation

Here is where things usually begin to go very wrong, with my usual luck, and I had little confidence that this ugly duckling would ever be a swan in spite of Ralph Bilal's confidence. Nevertheless, only 45 minutes had elapsed between opening the box and carrying the contraption to my shack...sort of a new record for me. There it sat on its tripod, daring me to fire up the rig and see what would happen. Okay, here goes.

Wow: signals—and quite loud, too! Putting the rig on the lowest possible output power, just enough to get a vswr reading, I was astonished to get a reading of below 2:1, and by careful adjustment of the small, parallel "tuning" plates attached to the upper and lower "diamond" plates, I was able to get a reading of below 1.5:1 at 7025 kHz. That is better than the standard trapped vertical I had been using was able to give me. I switched back and forth between the vertical (roof mounted, with 12 radials) and the Isotron 40, noticing that the QRN was appreciably lower on the Bilal antenna, whereas the received signals were not much if any different in strength. Once again, I was impressed with this little critter. Now if it would only transmit, I'd be happy.

Proof of the Pudding

Rather than timidly call a CQ, I decided to be brave and answer someone else. After all, if he didn't come back to me it wouldn't be my fault—or as disappointing—as if I had called and been found wanting. Okay, let's see...here's a good strong signal at 7031 kHz...KU1G...nice CW... there, he's signing...

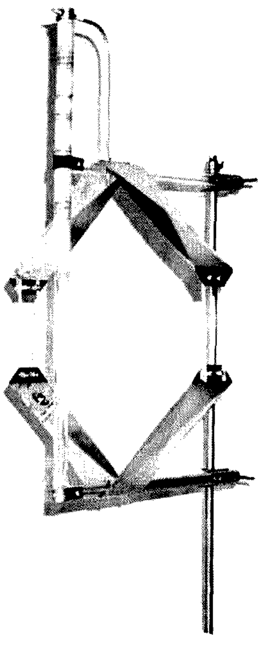
KU1G KU1G, de W1XU, W1XU, K.
W1XU de KU1G; R, R, Tnx call OM; ur sigs 599, 599 hr in Monroe, CT; name is John. Hw copy? $\overline{AR}$. W1XU de KU1G, K.

Wow! 599 in Connecticut! Well, maybe that's just an exception. Let's finish here with John and try another.

At 0020Z (twenty after seven, local time) I heard WX4L calling CQ. A quick shout and he came back: 559 in Gaffney, South Carolina. Name is Ed. Well, that is more reasonable, I thought, but still, all the way to South Carolina on an indoor "lump" ain't too shabby!

Next, I called Steve K4CXJ in Nashville, Tennessee, and we compared antennas. The trapped vertical gave me a 569 with QSB and the Bilal Isotron gave me a 569 with no QSB! The band wasn't great, but it was active.

Along about twenty before 9 I heard Bill K2SVC in Ithaca, New York, and he gave me a 599 with some QSB. A quick comparison showed the outdoor vertical at S9


The Isotron 40.

and the indoor Isotron at S8. Not bad, I'd settle for that any day.

After signing with Bill, I worked Jim KX8E in Highland, Michigan. Jim said I was 599 there and claimed very little if any difference between the vertical and the Isotron. It was obvious that the band was improving and that the mid-range stations were skipping in loudly.

I wonder if I ought to try a "local" to see what happens, I thought. There was Paul KB1MJ/BS with his brand-new Extra-class ticket on 7024 kHz. Giving Paul a quick call, I got a 589 from him. He was down a bit, I thought, but the 569 I gave him was still a good report. When he told me he was running 20 Watts to a home-brew *station* (not just a transmitter), I perked up. It seems that Paul actually loves to build gear, and his receiver is about 9 months along in development...with a few more to go until he is satisfied. The keying was very nice, home-brew, of course, and Paul said he made the paddles, too!

The transmitter was a combined solid-state vfo with a tube final. Nice. I suggested to Paul that when his station was completed to his satisfaction, maybe he ought to write it up for a magazine...hint, hint! Let's hope he does.

Well, it was getting late; maybe a couple more and then to bed. Tuning around, I discovered Frank VE2GG in Dorval, Quebec, on 7021 kHz. He came right back to my call: "599, OM." He was about a 589 at my station. Comparing antennas, Frank mentioned to me that the Isotron was S9+10 dB, whereas the outside antenna was only S9+5 dB! Here, the Isotron actually put out a better signal than the regular antenna! Probably skip angle, etc., but who cares? The performance of the Isotron 40 is just plain phenomenal.

My last QSO of the evening was with Chuck N8FNZ in Detroit. He gave me a 589 and I gave him a 579 at 0354Z, six minutes before eleven o'clock local time. Chuck was using his new Icom 751 and a dipole, sloping toward the east.

Well, time for hitting the sack soon, so I signed with him after a pleasant rag-chew and switched off the rig. Well satisfied with the evening's work, I decided to try SSB on Saturday morning. After all, with 75 Watts *output,* CW is a lot easier to *cut* the mustard than phone, I realized, so phone would be the final proof I needed to see if the isotron was really an antenna.

On Saturday morning at 9:50 local time, I heard W3DWI calling CQ. His signal was loud and I wanted to call him, but I had not changed the setting of the antenna to adjust it for lowest vswr up here on phone. Nevertheless, I decided, what the heck; I'll just call anyway; no harm if he doesn't hear me. A short two-by-two, and Ed in Chambersburg, Pennsylvania, came right back with a 5/7 report...very little QSB... nice steady signal. We exchanged the usual information and had a pleasant half-hour chat right in the midst of the Saturday morning QRM.

When the QSB took me almost out, I switched over to the outside antenna and was able to finish the QSO. So—we found out that under poor conditions, the outside BIG antenna is a bit better than the small (tiny) indoor one. Well, what's so surprising about that? That's what one would expect...but I was still very satisfied with the Isotron 40. Ralph hadn't lied to me yet; he hadn't overstated his performance figures; the antenna worked just as he said it would. Not only that, I firmly believe that if the Isotron 40 were placed at the same height as my vertical and outdoors, it would work equally well! That's a lot to say, but I think it is a true statement...and I'm going to prove it soon.

Later, after a long weekend of testing

the antenna (during which time, nearly 100 stations were worked on phone and CW), a pattern became quite clear: Under good conditions the Isotron 40 nearly equalled the much higher outdoor vertical. Under poor conditons, it was nearly three S-units poorer. On the average, the Isotron was only one to two S-units down compared with the vertical.

It will be desirable to mount the antenna outdoors at the same height as the vertical for further comparisons. I strongly believe, based on tests so far, that it could be almost as effective as the vertical.

Other stations contacted in the US were K4JE (589), W4LRD (579), and W2JUF (579). During the European Field Day, we worked the following foreign stations using the Isotron 40: ON7AR/P (589), G3WKX (589), DL0ET (559), DL0OS (379), DL0AU (559), G4GXK (579), DK0TU (599), DF0CN (599), PI4RT? (599), and GM3USL (599). Later, I heard NQ6E in San Francisco, and Bob gave me a 569. Of course everyone knows that all contest reports are not exact, but at least the antenna can work DX without a terrific disadvantage.

Many times my signal would be S8 on the Bilal antenna and S9 on the vertical. In only one case, reported before, was the Isotron better than the vertical.

Almost every station contacted in the US and Canada was very interested in knowing more about the Isotron. One operator even said he was going to buy the 80-meter version after hearing what the 40-meter version could do. So, there you have it, fans. Try one for yourself and see what *you* think.

Theory of Operation

The Isotron antennas may be capacitive hats on a loading coil . . . because that's what they appear to be electrically. However, there is a large radiating surface (according to Ralph) that would seem to make the Isotron antennas the equivalent *in surface area* to full-size antennas. This does not imply that the "capture area" of the Isotron is the equivalent of the larger antenna, however. In spite of the small size (31" × 18" × 12", approximately), it appears to be radiating quite efficiently—something that I had not thought possible with merely a loading coil with capacity hat as a radiator of rf energy.

The claimed bandwidth between 2:1 vswr limits is 200 kHz, according to Ralph's measurements. I was able to verify this approximately by swinging between roughly 7050 and 7250 kHz without retuning the antenna. However, for really critical work, it would be best to retune the antenna when moving from the low end CW portion to the high end SSB portion of the band.

Ralph mentions the fact that it is necessary to be very careful in adjusting and tuning the antenna because the surroundings can affect its impedance drastically. He gives some good counsel in the instructions about this, and several recommendations to follow in case tuning up is a problem. An rf noise bridge or similar device to help tuning is strongly recommended when setting up the Isotron for best performance.

Other Antennas by Bilal

Ralph Bilal can furnish a 160-meter Isotron, an 80-meter version, and a 20-meter version also. I would like to say that the one that looks most interesting to me is the combination 80/40 Isotron—actually two antennas, tuned to the bands, mounted back-to-back on a single mast, and fed with two separate feedlines. Living as I do in a home that rests in a small clearing in the woods, that would really solve my antenna problem. I have used a chimney mount for several different verticals and small beams, so I think it would be very practical, simple, and nearly ideal in my location to solve the problem with the Isotron system.

Conclusion

I really like the Isotron 40 and am going to be very interested in trying out the other versions to see if they perform as well on their respective bands as this one does on 40 meters. Certainly the price is reasonable, considering what you get: the 160-meter version that stands only 5 feet high and weighs only 12 pounds (smaller than most two-meter beams) for $149.95 plus shipping; the 80-meter version at 4½ feet and 7 pounds at $63.95; the 40-meter at 31 inches and 4 pounds for $52.95, and the 20-meter Isotron, on special sale at $39.95, measuring only 21 inches and weighing in at a mere 3 pounds. Finally, the 15-meter version at 21 inches and 2 pounds, goes for $32.95. All of these must have shipping costs added, varying between $3.50 and $8.50.

The 80/40 "Special" Isotron comes for only $110 plus $8.50 shipping cost, and there are also 15-meter and 10-meter versions for hams, as well as an 11-meter version for CB.

For your own Isotron, whatever it may be, call or write to the *Bilal Company, S.R. 2, Eucha OK 74342; (918)-253-4094*. Tell Ralph that *73* sent you, with a strong recommendation. Reader Service number 477.

Jim Gray W1XU
73 Staff

BARKER & WILLIAMSON'S AP-10 PORTABLE ANTENNA

Nothing that simple will ever work.

That was my first thought on viewing the Barker & Williamson AP-10 Portable Antenna. I had seen ads in ham publications from B & W but had always just glanced at them.

Now, however, for the first time in 15 years, I was faced with living in an apartment. I had changed jobs and moved from Ohio to Wisconsin, and I discovered that our new apartment complex allowed absolutely no outdoor antennas.

My father (K8MC), a veteran DXer of many seasons, had purchased the B & W antenna for me as a Christmas present. He did his best to convince me that this was better than no antenna at all. I decided to give it a try. It was a either that or face the unpleasant withdrawal symptoms associated with lack of exposure to Morse code.

The antenna had arrived in a neat little box with all of the parts inside. The parts included a 22½-inch whip which telescoped to 57 inches, coils for 10 meters through 40 meters (including 30 meters), a wire counterpoise, coax, and assorted screws and bolts. (*We've heard that the AP-10 will load on 2 and 6 meters without additional hardware. —Ed.*)

Also included was a very clearly written instruction booklet. Then again, the antenna was so simple that the instruction booklet necessarily was very basic and well written.

Assembly time was about 5 minutes and required only a screwdriver and a pair of pliers. To a seasoned DXer and this second-generation ham, it seemed too good to be true.

Not content to wait until I returned to Wisconsin, we put the antenna on the air at my father's old homestead in Ohio. Since the weather was a little nasty outside, we decided to clamp the antenna to a wooden table in the ham shack.

To make a long story short, the antenna worked. It's true we didn't work any exotic country on the first try, but our CQ calls produced solid contacts on 40 meters with hams in several east-coast states.

Since both of us use antenna tuners for all of our antennas, the B & W indoor whip was run through an MFJ tuner with 1000-Watt capacity. The swr was virtually a flat 1.1:1.

Upon arriving back in Wisconsin, I began to have second thoughts about the antenna loading up properly with my Triton 4. After all, that was a rugged antenna tuner we'd used in Ohio. However, my worries evaporated when I tuned the little whip attached to a wooden dresser in the bedroom with my DenTron Jr. Monitor tuner. Swr could be adjusted down to 1.4:1 throughout the CW portion of the 40-meter band. I called CQ and worked stations from Colorado to New York that first evening.

Summoning up all of my courage several evenings later, I attached the 20-meter coil. The swr on this band could be adjusted to 1.1:1, and I worked stations from California to New Hampshire.

Of course, I was very pleased and surprised by this kind of performance from a little indoor whip. In addition, I felt confident this little B & W product would keep me on the air even in the apartment-complex environment.

Needless to say, there are some compromises and shortcomings one faces up to when using this kind of antenna. You can't put out a booming, dominating DX signal, and you don't always get 599 signal reports. In addition, I have not tried the whip on SSB because I work 100% CW. I'm sure the results on voice transmissions would be disappointing with all of those 1-kW (and 5-kW, too, I suspect) signals on the air.

Working with this antenna on CW is very similar to working QRP. It takes a little more effort to hear the incoming signals and a little patience when transmitting, too. However, the proof is in the pudding, and the B & W whip has proved it can keep me on the air. Unless the bands are totally quiet, I can QSO just about any time I want to.

For example, I have worked 30 states on the 40-meter band, including California, Oregon, Utah, and Maine. While signal reports are not always good, the fact still remains that hams in those places actually heard me well enough to QSL.

The 20-meter band has been even better, and I've actually worked a little DX. I have QSL cards from Haiti, France, and the Virgin Islands. I have many more cards from all over the United States.

While I'm not saying the B & W model AP-10 antenna should be considered as a primary station radiator when better gear can be installed, I am saying that it apparently does the job it was designed to do. It keeps hams in my situation on the air. I'm grateful, because I'd hate to face those horrible symptoms of withdrawal brought on by the lack of exposure to Morse code.

For further details, contact *Barker & Williamson, 10 Canal Street, Bristol PA 19007.*

Rick Cochran WB8ULZ/9
Kenosha WI

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

AMATEUR RADIO IN WEST AFRICA

While tuning across 15 meters looking for a clear frequency to call CQ, I overheard the following complaint from a group of W2 DXers: "Have you noticed that there aren't any Africans on the air? There are never any African stations around." I broke in and agreed with their observation that African hams were few and far between. And then I signed my call, C5AAQ!

While those DXers got their wish of working an African station, many other DXers continue to lament the difficulty of working many of the countries on the African continent. A recent conversation with Tom Gregory N4NW gives some of the reasons behind this difficulty. Tom was stationed in the Ivory Coast for a tour of duty with the State Department, and he signed TU2NW during his stay in West Africa. Tom cites two major problems for hams in West Africa: the drought and the instability of many of the military governments in the region.

The drought in the region began more than five years ago. The westerly winds which sweep across the continent from the Indian Ocean seldom bring much rain to the inland areas, which is why the world's largest desert forms the bulk of the land area of these countries. But climatic changes have made the water problem much worse in recent years.

The drought affects amateur radio through the production of hydroelectric power. There isn't any. For many of the countries in the region, including Ivory Coast, Niger, Nigeria, Ghana, and Upper Volta, the lack of rain has run the reservoirs dry, and that means little or no electricity in these countries.

Obviously, the lack of electricity makes amateur radio much more difficult. While many of the families which are wealthy enough to afford ham radio can also af-

ford a gas-driven electric generator, that generator finds more use powering the drinking water distillery and keeping the refrigerator going than handing out QSOs to deserving DXers.

Even when the power is on, the cost of operating a radio can be extremely high in West Africa. When I was last in the region (1978), an American stationed in the region could count on an electricity bill of $500–1000 per month, just for household needs. You can imagine the bill for running a high-powered ham station for several hours a day!

However, the high cost (and frequent unavailability) of electric power is not the only problem facing West African amateurs. Tribal conflicts, political corruption, and staggering economic difficulties contribute to the highly volatile political situation in the region. Military coups and other changes in government are commonplace, and ham radio often loses out.

In the atmosphere of suspicion and intrigue, anyone with sophisticated communications gear, such as a multiband amateur transceiver, might be a threat to the existing government. And amateur radio is probably out of the experience of many of the people making policy decisions in these countries, which simply adds to the suspicion.

Let's look at what happened in Ghana as an example of the problems facing ham radio in the region. During the military coup in 1982, some of the Americans working in Ghana eavesdropped on the action with a Bearcat 250 VHF scanner. Living through a coup is a terrifying experience. Most official forms of news are cut off by one side or the other, and what you do hear is simply what they want you to hear, not necessarily what is actually happening. So this small group of Americans used their scanner to monitor the military and government VHF frequencies.

Unfortunately for ham radio in Ghana, a local African noticed this eavesdropping and reported the incident to the new powers that be. The new government was horrified to hear that someone could listen in on their supposedly-private radio communications and promptly arrested the Americans as spies!

Based on this incident, which really had nothing whatsoever to do with amateur radio, the new government banned all amateur radio in Ghana and confiscated all the rigs! When was the last time you heard a 9G station on the air?

The local amateur-radio club is working to get the ban rescinded, but it is a long, slow process to convince all the appropriate officials that amateur radio is a plus for their country. One amateur, 9G2XX, was a good enough friend of the Chairman of Ghana to get on the air, so perhaps normal ham radio will return to Ghana soon.

Even in countries where amateur radio has not been completely banned, written licenses are hard to come by. While the appropriate officials in the PTT or other telecommunications authority might be agreeable to issuing a license, such a request must also win the approval of the internal security people, a much more difficult task.

Whether this latter group goes under the name of Ministry of the Interior, Internal Affairs, or the Secret Police, their function is the same: keep the present government in power. And permitting unrestricted worldwide communications via ham radio is seldom part of their efforts.

So a person applying for an amateur-radio license in Ghana, Niger, Upper Volta, Benin, etc., will usually find his request sitting on the desk of some official in the Internal Affairs department, probably indefinitely.

Niger is a good example. DXpeditioners Carl and Martha Hansen traveled to Niger in an attempt to activate this hard-to-work country. Tom Gregory happened to be in the country at the same time, but even their combined efforts proved fruitless. Neither party could get the required permission to operate.

On the other hand, as long as no written license is needed, it is possible to get verbal permission to operate. Nobody's job (or head) is on the line (if the ham does turn out to be a spy) if there are no written documents. And ham radio does have great value for emergency and backup communications, especially away from the larger cities. The MARS-like operation of several French stations in Chad is a good example. These "amateur" stations are running health and welfare traffic from outlying military posts back to France. But don't bother to break in; their documentation won't pass ARRL DXCC muster. Unfortunately for DXers, contacts with these amateurs usually do *not* count for DXCC credit.

Working West Africa

So much for the bad news. Fortunately, there is some good news about amateur radio in West Africa. First, the region is ideally suited to excellent propagation. Sticking out into the Atlantic Ocean in the tropical latitudes around the equator, West Africa offers some super radio locations.

Propagation to the States and Europe is top-notch for many hours a day, and even the Japanese come through loud and clear along the all-water long path, around the tip of South America.

Tom Gregory suggests the months of September and October as good times to look for the West Africans. What rain they get inland falls mainly during that time, and electricity supplies are more reliable. Good radio propagation continues through the winter months, if the hydro power hasn't dried up.

As for the best time of day to look for stations in this region, Tom reminds DXers that local time in West Africa is UTC. As with stateside DXers, early-evening local time is when most of the amateurs sit down in front of their rigs. So search out those Africans in the 1600–2200 UTC range.

Tom spent a good deal of time on the lower frequencies, handing out contacts with his Kenwood TS830 and Alpha linear. Using a vertical on 40, Tom had good success working split frequency on 40-meter SSB. 7070 kHz is a good spot to look for the Africans on 40, coupled with a listening frequency between 7150 and 7200. 7167 is an especially good "hole" in the heavy interference in that part of the world. 2300 UTC is a good time to try 40.

75 meters is a difficult band in Africa because of the extensive use of the 3800-kHz band for RTTY and other point-to-point communications in ITU Region 1. Sometimes you can't even hear the static crashes because the interference level is so high! With the recent expansion of the US phone bands, Advanced licensees will get a crack at the 75-meter DX window of 3775–3800. Tom made about 1000 contacts on 75 during his stay as TU2NW.

While 160 meters is not an amateur band in Region 1, many countries have granted operating permission on Top Band. Tom wrangled 160-meter operating privileges, but had little success on the band. Dragging himself out of bed at 5:30 in the morning, Tom slugged it out on 160 to the tune of 5–10 contacts per night. Even the *CQ* Worldwide contest only yielded 6 160-meter QSOs. Tom transmits in the DX window and listens at 1818 kHz.

Tom made about 12,000 contacts during his tour as TU2NW, and he will be missed by those looking to confirm Ivory Coast. Anyone who hasn't yet confirmed their contact with TU2NW can do so through Tom's QSL manager, AK3F. *Do not* send cards to TU2NW through the bureau system. As with many visitors and DXpeditioners, the cards won't arrive in the country until long after the operator has departed. The chances of your bureau card catching up with the operator are very slim. Tom also operated as TU73 during the spring of 1984 (a special callsign granted for WPX contests). If you missed TU2NW, you still can work Ivory Coast. Tom reports that there are about 20 active amateurs in Ivory Coast now, mostly French visitors. Assid TU1BS is one of the more active hams, and TU2JD occasionally runs pileups in English.

DXpeditioners might find some of the rarer countries very difficult to activate for DXCC, but other countries in the region are good DXpedition spots. In Mauritania, for example, Tom got his 5T5NW license in six minutes! Mauritania is somewhat unique in the region in that it only issues amateur-radio licenses to expatriates, not to locals! Other possibilities are Senegal, The Gambia, and Gabon. As with many of the French-speaking countries in the region, a letter written in French has the best chance of gaining a valid license.

For anyone traveling to the area, Tom suggests writing (in French) to the PTT giving the usual information about your operation: passport information, dates, location, rigs, etc. A copy of your stateside license and a couple of photographs are also necessary. A letter from your local Chief of Police attesting to your good character is a valuable addition.

Since many of the amateur licensing authorities in the region work closely with the local amateur-radio club, it would be a good idea to include the local club in your plans. A letter to the radio club at the same time as your letter to the PTT licensing group can help speed your application.

Meanwhile, Tom Gregory is back in Africa, this time stationed in Pretoria, South Africa. He reports that he should be on the air as N4NW/ZS6 by September. Then he expects to take the South African amateur exam to get his own ZS call by the end of the year.

Since Tom's work for the State Department has him traveling around the region, he might show up from another country at any time. In addition to his TU2NW license, Tom holds 5T5NW and J5NW. Current plans call for an operation from Swaziland 3D6 for the *CQ* Worldwide SSB at the end of October.

In addition to the low-band frequencies mentioned above, you can look for Tom around 14155 or 14180, and 21255 or 21280. He runs RTTY with his Commodore 64 computer and he is often found on CW as well.

While in southern Africa, Tom has high hopes of breaking the logjam of amateur licensing in Mozambique. C9 amateurs have been nonexistent since the communist-leaning present government took power. However, recent breaks between the Soviets and Mozambique suggest that some changes might be in the offing.

QSL Manager Wanted

With his change in location, Tom is looking for a new QSL manager to handle his ZS contacts and other operations in the region. Since he keeps his log on a disk with his Commodore 64, a manager with the same computer equipped with a disk drive would be ideal. Tom can then send a floppy disk up once a month for the confirmations. If you are interested in this job, contact Tom Gregory at the Department of State, Pretoria, Washington DC 20520.

Meanwhile, enjoy the good propagation of the fall months. The next few summers are likely to be as lousy for DXing as the summer of '84, so concentrate on working what you can when the bands are open. And look for T32AW from Christmas Island in the Pacific at the end of the month (including *CQ* Worldwide SSB). That's yours truly out there. OSL T32AW via K1RH.

DR. DIGITAL

Robert Swirsky AF2M
PO Box 122
Cedarhurst NY 11516

THE DR. DIGITAL POLL

It's hard to judge what interests the typical Dr. Digital reader solely from the mail I receive. Only certain people are motivated to write letters; for most, the process takes too much time or effort. I am going to get around this problem by conducting a poll. While John Edwards' "FUN!" poll revealed some information about the computer habits of amateur-radio operators, it was not specific enough for my needs. So grab a pencil and answer the following questions.

Send your responses to the address listed at the top of this column. You may keep your responses anonymous.

1) Which microcomputer(s), if any, do you own?

a) Apple
b) Atari
c) Commodore
d) Epson
e) Franklin
f) IBM PC
g) Osborne
h) TRS-80
i) S-100 (IEEE-696)
j) Other

2) Which computer language(s) are you *proficient* in?

a) Assembly language
b) Ada
c) Basic
d) C
e) COBOL
f) Forth
g) LISP
h) Pascal
i) PL/I
j) Other

3) Do you have any experience with mini- or mainframe computers?

a) Yes
b) No

RESPONSE FORM

Read each question and mark your response by circling the appropriate letter next to the number of the question.

1) a b c d e f g h i j	6) a b c d e	11) a b	16) a b	21) a b c d e
2) a b c d e f g h i j	7) a b c d	12) a b	17) a b	22) a b
3) a b	8) a b	13) a b	18) a b	23) a b
4) a b c d e f g h	9) a b	14) a b	19) a b	24) a b
5) a b c d	10) a b	15) a b	20) a b	25) a b c
				26) a b

Comments: ______________________________

4) What amateur-radio applications do you have for your computer?
- a) RTTY
- b) Control of amateur-radio equipment
- c) Record keeping (logs, contests, DXCC list, etc.)
- d) Number crunching (filter design, coordinate calculations, etc.)
- e) Satellite tracking
- f) Morse-code training
- g) SSTV
- h) Other

5) If you use computerized RTTY, which mode(s) do you use?
- a) Murray or Baudot
- b) ASCII
- c) AMTOR
- d) CITOR

6) How much have you spent on computer equipment?
- a) Under $500
- b) $500 to $1499
- c) $1500 to $2999
- d) $3000 to $5000
- e) Over $5000

7) What percentage of your computer programming is done in assembly language?
- a) None
- b) Under 33%
- c) Between 33% and 66%
- d) Over 66%

8) Have you ever built any computer hardware?
- a) Yes
- b) No

9) Have you ever designed any computer hardware?
- a) Yes
- b) No

10) Have you ever made any repairs or modifications to your computer system?
- a) Yes
- b) No

11) Do you own any computer test equipment (i.e., logic probes, scopes, etc.)?
- a) Yes
- b) No

12) To which hobby do you devote more time?
- a) Computers
- b) Amateur radio

13) Do you belong to a computer club?
- a) Yes
- b) No

14) Do you belong to an amateur-radio club?
- a) Yes
- b) No

15) Are you in favor of a digital-class license in the United States?
- a) Yes
- b) No

16) Which hobby have you been involved with longer?
- a) Amateur radio
- b) Computers

17) Do you own a modem?
- a) Yes
- b) No

18) Have you ever used a data base program, such as dBase II, for amateur-radio purposes?
- a) Yes
- b) No

19) If you had to choose only one hobby, which would you pick?
- a) Amateur radio
- b) Computers

20) Are you planning on purchasing more computer equipment in the near future?
- a) Yes
- b) No

21) What is your age?
- a) 15 or below
- b) 16–21
- c) 22–39
- d) 40–59
- e) 60 or above

22) Have you ever written any amateur-radio computer software?
- a) Yes
- b) No

23) Have you ever purchased any amateur-radio computer software?
- a) Yes
- b) No

24) Do you own a microprocessor-controlled rig?
- a) Yes
- b) No

25) What would you like to see emphasized in this column?
- a) Hardware
- b) Software
- c) Equal empasis on both

26) Have you ever used a packet repeater?
- a) Yes
- b) No

Feel free to add any additional thoughts or comments. It is hoped that the information I receive will assist me in choosing topics for the column.

ANOTHER APPROACH TO COMPUTER INTERFACING

Whenever I discuss computer-to-amateur-radio interfacing, I always assume that the reader has a computer with a programmable parallel port or some TTL output lines available. Many computers, however, have only an RS-232 serial port available. This type of port is meant to carry ASCII data and is not suited to control devices.

To get around this problem, a number of companies have developed serial I/O controllers. These devices interpret certain ASCII characters from a serial port and use them to control relays or other switching devices. With a serial I/O controller, for example, a TRS-100 can be used to control electronic equipment without an extra I/O port.

One serial I/O controller is the Sias Engineering CIP/35. This device will interface to any computer that has an RS-232 port. Using certain ASCII characters, the host computer can switch any one of eight relay-controlled outputs on or off. The CIP/35 also has eight inputs that can be read through the serial port.

A controller such as the CIP/35 has some interesting uses. If, for example, a CIP/35 is used to control a repeater, it can be connected with an auto-answer modem to a phone line. The computer does not have to be located at the same site as the controller. This way, one does not have to dedicate a computer for control purposes.

Each output on the CIP/35 can handle 6 Amps. The eight inputs are optically isolated from the board. For more information on the CIP/35, contact Sias Engineering, Inc., R.R. 1, Box 315, Salina, Kansas 67401; (913)-823-8027.

TIPS ON CHIPS

A good way to learn digital electronics is to learn about the various types of digital integrated circuits on the market. Every manufacturer of integrated circuits publishes spec sheets and data books describing their product line. These publications, which are usually available at modest cost, contain a great deal of useful information.

One reference which I use often is the National Semiconductor *Databook*. This publication lists many types of digital logic circuits ranging from simple NAND gates to complex multiplexers and shift registers. Chips are described using pinout diagrams, truth tables, timing diagrams, logical equations, and electrical characteristics. Applications notes are also given. For more information on this *Databook*, as well as other publications from National Semiconductor, contact National Semiconductor Corporation, 2900 Semiconductor Drive, Santa Clara, California 95051.

Some other companies that have low-cost publications available are: Intel Corporation, 3065 Bowers Avenue, Santa Clara, California 95051; Rockwell International, Electronic Devices Division, 1842 Reynolds, Irvine, California 92626. When writing to these companies, ask for their "literature guide." Intel and Rockwell also have many free publications available. These, too, are listed in their literature guides.

NEW PRODUCTS

LARSEN NMO ANTENNAS, PO-K MOUNTING KITS

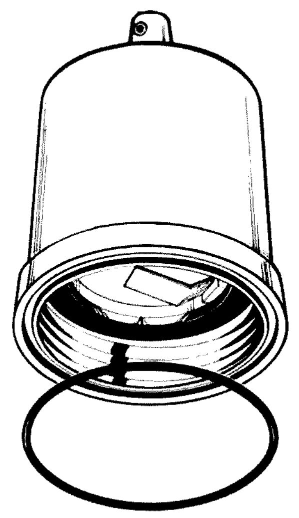
The Larsen PO-K mounting kit features SO-239-style mounting hardware that can be installed entirely from outside the vehicle. The PO series mount looks like the SO-239 connector (sometimes called a female UHF connector), but unlike the SO-239, it can be installed from outside the vehicle. Its two O rings and one gasket offer super moisture sealing.

Larsen's PO-K includes complete mounting kit and coax; the PO-B contains mounting hardware only.

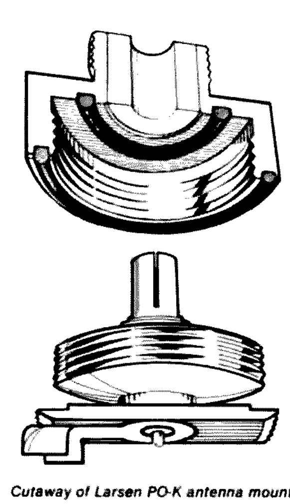
Larsen NMO series antennas offer improved weather protection. The improved NMO coil features an extra lip around the bottom, providing a place for an O ring. The ring surrounds the threads that tighten to the vehicle surface, eliminating the chance that water may be drawn through the threads and decrease performance or corrode mounting hardware.

All NMO series VHF and UHF products now include this change. LM and NLA series are equipped with a neoprene gasket around mounting hardware for a weather-tight seal.

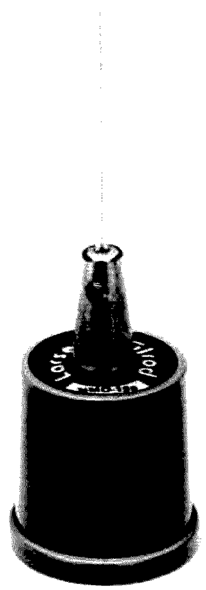
For more information, contact *Larsen Electronics, PO Box 1799, Vancouver WA 98668; (206)-573-2722.* Reader Service number 482.



Larsen NMO antenna base and weather-sealing O ring.



Cutaway of Larsen PO-K antenna mount.



A Larsen NMO antenna.

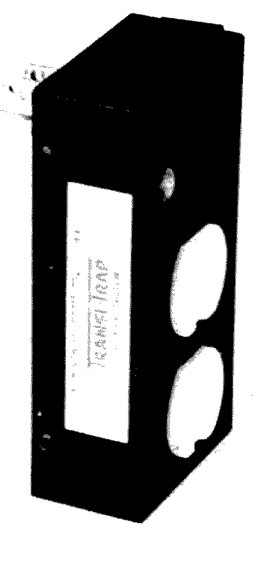
ANTUNER AND HAM-ANTUNER

J. L. Industries has introduced Antuner, an automatic antenna tuner with no moving parts. Antuner covers a wide spectrum of frequencies from .1 MHz to 100 MHz. An antenna system with Antuner in which 50 feet of wire is attached to the hot end of the unit and a minimum of 25 feet is attached to the ground side of the unit will produce an swr of no higher than 1.5 to 1. For frequencies above 12 MHz, it rarely exceeds 1.2 to 1.

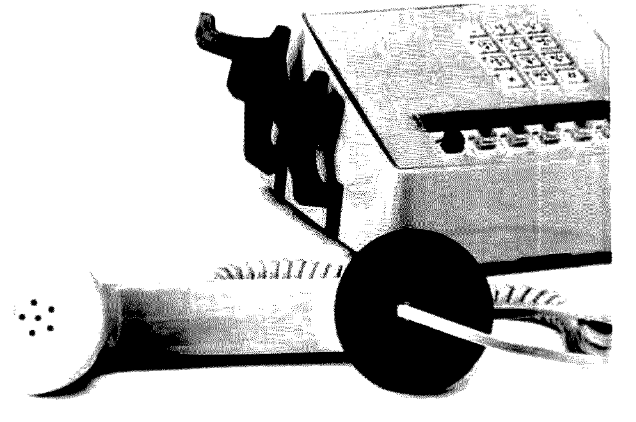
To achieve these results, Antuner incorporates the use of sophisticated circuitry for tuning as well as input-impedance stabilization. All this is accomplished by the use of a three-port circulator. The system is phased so that there is minimal attenuation in the feed direction and a much greater attenuation in the reverse direction. Currents in the feed direction induce currents in the windings that are in phase, while currents in the reverse direction induce currents that are out of phase. A wideband instantaneous antenna tuner without moving parts is the result. Completely passive, it is an efficient coupling system for an asymmetrical dipole antenna. If desired, a longwire could be connected to the hot end of Antuner and a good ground to the ground side of Antuner. Antuner can be used for marine installations (sailboats and commercial ships), oil rigs, ham radio for airplanes, and for special situations in which unobtrusive horizontal antennas are needed.

The Antuner can handle 1000 Watts PEP. A 300-Watt version, called the Ham-Antuner, is also available.

For more information, contact *J. L. Industries, PO Box 547, Hallandale FL 33009; (305)-458-6094.* Reader Service number 481.



The Transi-Trap surge protector from Alpha Delta Communications, Inc.



The Black Jack portable modular-telephone jack attachment for computer telecommunications.

SURGE PROTECTOR FROM ALPHA DELTA

The new Alpha Delta Communications, Inc., Model ACTT ac Transi-Trap™ is a direct plug-in-the-wall ac surge protector which includes two 120-V-ac sockets, status light, circuit breaker, and a unique 3-stage automatic surge-protection circuit.

The Model ACTT provides both transverse- and common-mode protection with a hot-to-neutral, neutral-to-ground, and hot-to-ground 6000-volt, 2000-Amp surge discharge self-restoring high-speed circuit. (Several typical competitive devices use only a single-stage, 100-Amp protector.)

The configuration of the Model ACTT also protects equipment plugged into any other common-branch ac wall outlet down line from the ACTT.

The unit is UL listed and is available at Alpha Delta dealers or direct from the manufacturer.

For more details, contact *Alpha Delta Communications, Inc., PO Box 571, Centerville OH 45459; (513)-435-4772.* Reader Service number 478.

PORTABLE MODULAR JACK FOR MODEMS

The Microperipheral Corporation has announced a new portable modular-telephone jack attachment for computer telecommunications. The product is marketed under the trade name Black Jack™.

The Black Jack solves telephone and computer interface problems encountered by growing numbers of portable-computer owners and direct-connect modem users. Most hotels, offices, and other locations from which computerized telecommunications are desirable and necessary do not have modular (RJ11C) jacks. Unless special equipment is installed or the bulky old-fashioned carbon acoustical coupler cups are used, telecommunications are not an option from many locations.

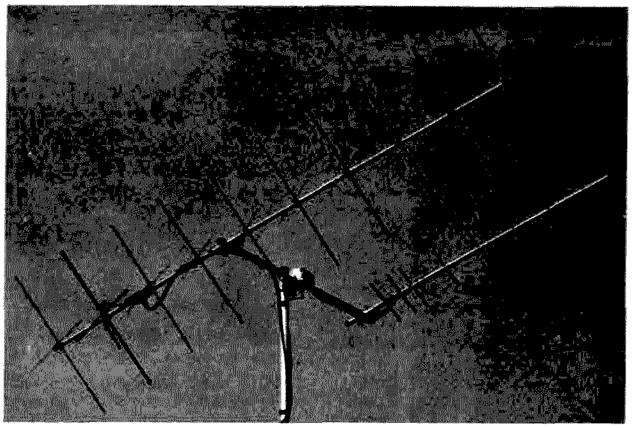
The Black Jack is constructed of rubber with a built-in circuit card and modular jack. Its unique connectors make it compatible with single- or multi-line telephone handsets such as those manufactured by Bell, ITT, and GTE. The unit requires no power. Modems equipped with touch-tone™ dialing may dial directly through the Black Jack. Pulse dialing is accomplished on the telephone set itself.

In addition to solving the problems associated with hard-wired telephones lacking modular jacks, the Black Jack eliminates the loss of line sensitivity associated with the use of acoustical couplers. The new direct-connect modems result in sensitivity gains of approximately 20 dB over the old-fashioned acoustical couplings. The Black Jack lets the modem user keep these line-sensitivity gains while improving telecommunications performance.

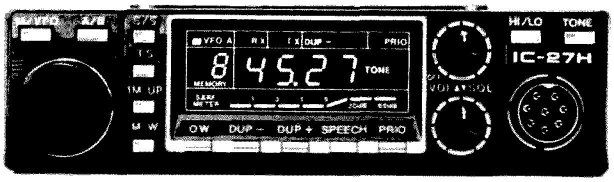
For additional information, contact *The Microperipheral Corporation, 2565 152nd Avenue NE, Redmond WA 98052; (206)-881-7544.* Reader Service number 483.

HAMTRONICS OUTDOOR SCANNER ANTENNA

Hamtronics, Inc., a manufacturer of low-noise receiving equipment for amateur radio, has announced a new antenna for scanner and monitor buffs to serve a need for a scanner antenna which is halfway between a built-in whip on a scanner and a large outdoor antenna requiring roof mounting with some sort of mast arrangement. Hamtronics has designed a compact "Power Antenna" which may be installed easily on the side of a house, outside a window, in an attic, etc., without any special mast or brackets.



Cushcraft's new amateur satellite antenna system.



The IC-27H 2-meter mobile transceiver from Icom.

The ACT-1 Power Antenna is a broadband whip antenna with a low-noise preamplifier in its base. Although much smaller than a full-size outdoor antenna (25 inches tall), it provides good coverage of distant signals and is capable of outperforming larger antennas because of the active booster amplifier. The built-in preamp has a gain of up to 15 dB.

A low-noise microwave transistor in the preamp covers from 30 MHz through the new 800-MHz band, and it covers low-band, high-band, and UHF. It is a good outdoor antenna for the 800-MHz band. The problem of large losses in the coax cable is solved by the amplifying of the weak signal from the antenna before the coax cable run can degrade it. There is a benefit from this effect even on UHF and VHF reception. In this regard, the ACT-1 can outperform an outdoor antenna with a separate preamp at the radio.

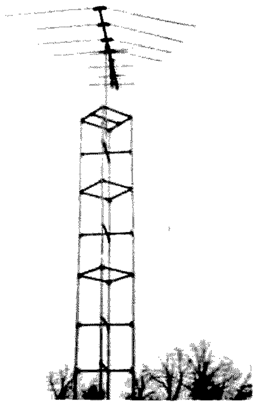
The simple installation required for an ACT-1 antenna and the fact that it is shipped fully assembled make it easy to improve on the performance of radio-mounted whips. Four wood screws mount it to any flat vertical surface. The 50-foot cable plugs directly into the "antenna" and "12-V" jacks on the rear of most scanner radios. If your particular scanner doesn't have a 12-V terminal, a simple 12-V-dc plug-in adapter is available.

For more information, contact *Hamtronics, Inc., 65-F Moul Road, Hilton NY 14468-9535; (716)-392-9430.* A complete catalog is also available for purchase. Reader Service number 485.

CUSHCRAFT SATELLITE ANTENNA SYSTEM

Cushcraft has introduced a new complete amateur satellite antenna system featuring two high-gain, circularly-polarized yagi antennas. The 70-cm, 16-element uplink and 2-meter, 20-element downlink antennas are fixed to a common mounting boom. The entire array is lightweight with reasonable dimensions for quick installation.

For more information, contact *Cushcraft Corporation, PO Box 4680, Manchester NH 03108; (603)-627-7877; telex 953050 Cushsig Man.* Reader Service number 480.



An antenna tower constructed with FrameMaker clamps.

BUILD YOUR OWN TOWER WITH FRAMEMAKER CLAMPS

Build a sturdy, professional-looking tower for a TV, CB, or ham-radio antenna out of common 3/4-inch electrical conduit and plated-steel FrameMaker Clamps.

The only tools needed are a hacksaw (or tube cutter) to cut the conduit and a couple of wrenches. Conduit sections are simply placed into the openings of the clamps, and the plated nuts and bolts are tightened, locking the clamp jaws securely around the conduit.

To avoid the pitfalls of "one-clamp-does-all" designs, several kinds of FrameMaker clamps are made: 4-way fixed and adjustable, 3-way T, 2-way adjustable, and parallel. No locking collars or set screws are needed to prevent slippage. Unlike towers whose joints are welded or brazed, a tower made with FrameMaker clamps can easily be taken down, and the clamps and conduit can be used to build any number of other projects.

Free project idea brochure is available from *Bullseye Products, Dept. DY, 28506 Hayes, Roseville MI 48066.* Reader Service number 479.

IC-27H

Icom has introduced another in its line of ultra-compact mobiles: the IC-27H 45-Watt, 2-meter mobile transceiver.

Standard features include compact size (1-5/8"H × 5-1/2"W × 9-3/8"D), built-in internal speaker for easy mounting, nine full-function memories, 32 built-in PL™ frequencies, IC-HM23 DTMF microphone with up/down scan buttons, three scanning functions (memory scan, band scan, and priority scan), internal lithium-battery memory backup to maintain memories for up to five years, and the IC-MB27 mobile mount.

A variety of options are also available, including an IC-UT16 speech synthesizer and IC-SP4 and SP5 external speakers.

For more information, contact *Icom America, Inc., 2112 116th Ave. NE, Bellevue WA 98004.* Reader Service number 486.

ANTENNA DESIGN SOFTWARE

Smith Software Systems has released their latest ham-related software package for the Apple II+ and IIe computers. Antenna Design Software is a menu-driven program composed of twenty-six submodules to help in the design of HF/VHF/UHF antennas and transmission lines.

Capabilities include design of antenna types such as dipole, folded dipole, vertical, longwire, 2- and 3-element quad, parabolic dish, and loop. Help is also provided with calculating feedline losses, phasing lines, transmission-line transformers, and swr. There are also several related topics such as propagation and component design.

The package was developed with the newcomer to ham radio and computers in mind, but it will be an excellent asset to the expert in helping with long and tedious calculations. The package includes a diskette (not copy protected) and an extensive user's manual.

For additional information, contact *Smith Software Systems, 3767 Cold Spring Creamery Road, Doylestown PA 18901.* Reader Service number 464.

✓ See List of Advertisers on page 98

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atoo NJ 08004

COLUMBUS DAY INTERNATIONAL DX CONTEST
Starts: 1200 GMT October 13
Ends: 2400 GMT October 14

The first DX contest in commemoration of Columbus Day will be sponsored by the Miami Havana Lions Club. The official contest operators will identify themselves with their QRA, callsign, and with their official number as contest operators. Suggested frequencies will be US amateur bands in 10, 15, 20, 40, and 80 meters, phone and CW.

An amateur station making five contacts with official radio-club DX member operators during the two days will be eligible to apply for the Miami Havana Lions Club QSL Award. Contacts with official operators must be made during the contest period, exchanging RS(T) and QTH. English, Spanish, and Portuguese languages will be used.

SWLs may also apply for this award on a heard basis. Send QSLs or log along with $2.00 in US funds or 6 IRCs for this special award to: Miami Havana Lions Club, Columbus Day International DX Contest, Box 674, Miami FL 33155.

At the start of the contest, members of the contest committee will read the names and assigned numbers of the official operators on the following frequencies: 7230, 14250, 21250, and 28915.

RIO CW DX PARTY
Starts: 1500 GMT October 13
Ends: 1500 GMT October 14

Sponsored by the Pica-Pau Carioca (Rio Woodpeckers CW Group), PO Box 2673, 20001 Rio de Janeiro, RJ, Brazil (with the cooperation of all other Brazilian CW groups). The purpose is to promote 2-way CW contacts between Brazilian and DX stations, enabling DX stations to obtain QSLs valid for several Brazilian Awards. The event is held twice each year on the last full weekend in March and the second full weekend in October.

The general call is "CQ RIO DX PTY". Use all HF amateur bands within your own station-license authority. Exchange RST, name and QTH. There are no logs, but quick QSLing (via bureau or direct) is essential.

Reference frequencies are as follows: 3510/3520, 7020/7030, 14030/14050, 21030/21050, 21130/21150, and 28030/28050.

OREGON QSO PARTY
1700 GMT October 13
to 0800 GMT October 14
1500 GMT October 14
to 0000 GMT October 15

The Hermiston Amateur Radio Club invites all amateurs to participate in the Oregon QSO Party. Each station may be worked once per band and once per mode. Crossband and crossmode contacts are not permitted.

EXCHANGE:

Signal report and state, province, country, or OR county.

FREQUENCIES:

Phone—1810, 3929, 7260, 14300, 21370, and 28600; CW—60 kHz up from bottom of each Novice band; VHF—contacts on simplex only, excluding 146.52.

SCORING:

Count one point per QSO. OR stations multiply QSO points by the sum of states, provinces, countries, and OR counties. All others multiply by the sum of OR counties worked (36 maximum).

ENTRIES AND AWARDS:

All entries must have a log and summary sheet, and if more than 200 contacts are made, a dupe sheet should be included. Entries may be disqualified if logs are incomplete or too many errors are detected. You must sign the summary sheet stating that you observed all the rules. You may photocopy log and dupe sheets or you may obtain extras from the HARC (please send SASE). Logs must be received by November 12th and should be addressed to the Hermiston Amateur Radio Club, PO Box 962, Hermiston OR 97838. Include a large SASE for a copy of the results.

RHODE ISLAND QSO PARTY
1700 GMT October 13
to 0500 GMT October 14
1300 GMT October 14
to 0100 GMT October 15

This contest is sponsored by the East Bay Amateur Wireless Association. RI stations work other RI stations and the rest of the world. All others work only RI stations. The same station may be worked twice on each band: once on phone and once on CW.

EXCHANGE:

RS(T) and state, province, country, or RI city.

FREQUENCIES:

Phone—3900, 7260, 14300, 21360, 28600, 50.110, 144.2, and 146.52; CW—1810, 3550, 3710, 7050, 7110, 14060, 21050, 21110, 28050, and 28110. Use FM simplex; no repeaters.

SCORING:

All stations score 2 points per phone QSO, 3 points per CW QSO, and 5 points for QSOs with Novices and Technicians. RI stations multiply QSO points by the number of states, provinces, and countries worked. Others multiply total QSO points by the number of different RI cities and towns worked (39 maximum).

AWARDS:

Certificates awarded to top-scoring station in each state, province, country, and RI county; plus top-scoring Novice and Technician in RI and out of state. There will also be a certificate for the top RI multi-operator station.

ENTRIES:

Logs must show date/time in GMT, call, exchange, band, and mode. Include your name, call, mailing address, club affiliation if any, total QSO points, multipliers claimed, and final score. Entries must be postmarked no later than November 15th and should be sent to East Bay Amateur Wireless Association, PO Box 392, Warren RI 02885. Include an SASE for results.

MARYLAND-DISTRICT OF COLUMBIA QSO PARTY
Starts: 1800 GMT October 13
Ends: 2100 GMT October 14

Sponsored by the Columbia Amateur Radio Association, the contest is open to all single-operator stations. The same station may be worked on each band and mode.

EXCHANGE:

QSO number; RS(T); and state, province, country, or MD county. Remember that Baltimore and Washington are independent cities!

SCORING:

MDC stations multiply total QSOs by sum of MD counties, states, provinces, and countries. Others multiply MDC QSO total by number of MD counties and independent cities (25 maximum). Also, multiply score by 1.5 if running 200 Watts or less.

FREQUENCIES:

Phone—3950, 7250, 14290, 21390, and 28590; CW—60 kHz up from low end; Novice—3720, 7120, 21120, and 28120.

AWARDS AND ENTRIES:

Maintain a continuous log for phone and CW, but indicate on entry which category (phone, CW, or mixed) you are entering. Certificates for top scorers in each category will be awarded. Mail logs, dupe sheets (for over 200 contacts), and summary by November 30th to CARA, c/o Robert K. Nauman WA3VUQ, 4017 Font Hill Drive, Ellicott City MD 21043.

JAMBOREE ON THE AIR
0001 Local Time October 20
to 2400 Local Time October 21

JOTA is Scouting's annual ham-radio event, held during the third weekend of October. This is the 27th year it has been held, with thousands of stations around the globe participating. If propagation is right, it is common to work Scouting DXCC. In past JOTAs, Scouts in some remote areas like Antarctica, Ascension Island, Christmas Island, Gough, and Seychelles were heard.

In the USA, many Scout Councils and Districts hold camporees to coincide with JOTA. Hams set up Field-Day-type operations, giving campers a chance to exchange greetings with Scouts everywhere.

Generally, the exchanges include typical information like name, QTH, Scout rank, hobbies, etc., with some leading to long-lasting pen-pal friendships and the exchange of photos, badges, and patches. SSTV and ATV give some a chance to have a "look-see" at the other guy. Other QSOs reported were via RTTY, EME, and even OSCAR.

Look for K2BSA (the BSA Headquarters station in Dallas TX), HB9S (the World Scout Headquarters in Switzerland), and for other special callsigns from many countries.

Boy Scouts and Girl Scouts of all ages, Scouters, former members, ham-radio operators, and anyone interested in doing a good turn for Scouting and ham radio are invited to participate. The contest period is given in local time, though some activity flops over from Friday to Monday to take advantage of DX time differences.

Suggested frequencies are 3590, 7030, 14070, 21140, and 28190 on CW; 3940, 7290, 14290, 21360 and 28990 on phone; RTTY, SSTV, and ATV on usual frequencies. Check the Novice frequencies and please move off these calling frequencies to avoid QRM.

No reports in the form of logs are necessary, this is really not a contest. Exchanges should be relaxed and relate to Scouting and ham radio as much as possible. Brief reports, however, are appreciated, giving Scout unit numbers, ham calls used and heard/worked, numbers of participants, interesting incidents and exchanges, etc. Photos with captions especially welcome for the BSA report to the World Bureau. Send them to JOTA Coordinator W2GND, 216 Maxwell Ave., Hightstown NJ 08520.

Radio amateurs are encouraged to invite Scouts or even Scout units to their shacks. If you do not know any, contact your local Scout office for the name of the unit leader in your area. You or your radio club may volunteer to participate in a district or council camporee that weekend. Phone books list council offices as Boy Scouts of America. Call "CQ Jamboree" or respond to such calls and observe all FCC regulations. Consider a fox hunt for more fun.

If you are not a ham or do not have one in your unit, contact one in your area for

CALENDAR

Oct 6–7	ARRL QSO Party—CW
Oct 13–14	ARRL QSO Party—Phone
Oct 13–14	Rio CW DX Party
Oct 13–14	Columbus Day International DX Contest
Oct 13–14	Maryland-DC QSO Party
Oct 13–15	Oregon QSO Party
Oct 13–15	Rhode Island QSO Party
Oct 20–21	Jamboree on the Air
Oct 20–21	Worked All Y2 Contest
Oct 20–21	CLARA Ac/Dc Contest
Oct 27–28	CQ Worldwide DX—Phone
Nov 3	DARC Corona 10-Meter RTTY Contest #4
Nov 3–4	ARRL Sweepstakes—CW
Nov 11	International OK DX Contest
Nov 17–18	ARRL Sweepstakes—Phone
Nov 24–25	CQ Worldwide DX—CW
Dec 1–2	ARRL 160-Meter Contest
Dec 8–9	ARRL 10-Meter Contest
Dec 26–Jan 1	QRP Winter Sports—CW
Dec 30	Canada Contest
Jan 12–13	Hunting Lions in the Air Contest

help. If you need help finding one, contact Leo Kluger, American Radio Relay League, 225 Main St., Newington CT 06111. Make reports as indicated above, coordinating with your ham helper.

Certificate cards the size of a postcard are available to anyone participating in any way. They may be ordered beforehand for presentation during JOTA or they may be awarded at Scout or club meetings later. Send requests to Jamboree On The Air, 1325 Walnut Hill, Irving TX 75062, along with an SASE large enough to hold the cards ordered. Affix postage at 20 cents for the first 20 cards and 17 cents for each 8 cards thereafter.

A temporary insignia to wear on the Scout uniform or on jackets is available at $1.25 from the TX address above. Separate orders for certificates and patches will get them to you faster.

The World Scout Bureau, sponsor of JOTA, holds a QSL card contest with 5 prizes for the best handmade cards and 5 prizes for the best printed cards. Entries must be designed by registered Scouts (boy or girl) 18 years of age or less. They must be in standard postcard size and be marked on the back with name, age, Scout unit, and full home address (include USA). Send entries to JOTA QSL Contest, World Scout Bureau, PO Box 78, 1211 Geneva 4, Switzerland. They must be received by December 31st and entries will not be returned. Winners will be notified by March 31st. It would help if radio amateurs would suggest ideas about QSL-card design, including Scout and ham-radio cartoons, etc.

RESULTS

1984 TWO-LAND QSO PARTY

Call	County	QSOs	QSO Points	Multipliers	Score
	In Two-Land				
NC2V	Salem NJ	818	1290	198	249,480
W2EZ/M	Various	138	413	41	16,933
WA2SQ/M	Various NJ	84	252	54	13,606
K2HPV	Gloucester NJ	102	216	58	12,528
N2CQ	Gloucester NJ	63	189	49	9,261
AB2W	Gloucester NJ	51	102	32	3,466
KD2EZ	Mercer NY	56	112	26	2,912
WB2IPX	Cayuga NY	30	79	19	1,501
K2DNN	Chemung NY	20	60	19	1,140
K2PF	Somerset NJ	9	25	6	150
W2CC	Bergen NJ	1	2	1	2
	Outside Two-Land				
KA1CLV	MA	27	81	21	1,701
W5WG	LA	29	60	19	1,140
W8RYP	OH	21	63	18	1,134
N0CLV	KS	29	75	17	1,275
K1VUT	MA	18	47	15	705
W5NR	TX	10	30	10	300
WA7FKD	WY	10	30	7	210
K0HQE	IA	6	18	6	108
K9JIG	WI	7	14	7	98
K8KIR	MI	6	18	5	90
W3IJT	WV	5	10	5	50
KA7T	ID	6	9	3	27

WORKED ALL Y2 CONTEST
Starts: 1500: GMT October 20
Ends: 1500 GMT October 21

The Radioclub of the German Democratic Republic (RKDDR) is pleased to invite radio amateurs all over the world to participate in and commemorate the anniversary of the founding of the German Democratic Republic. Operating sections include single- and multi-operator stations as well as SWLs. Each Y2 station may be worked once per band on phone and once per band on CW.

EXCHANGE:

RS(T) plus serial number starting at 001. Y2 stations will send a two-digit number of "Kreiskenner" instead of a QSO number.

FREQUENCIES:

Use all amateur bands, 3.5 thru 28 MHz, with the first 10 and last 25 kHz of the 3.5- and 14-MHz bands to remain contest-free.

SCORING:

Count 3 points per Y2 QSO. Multiplier is the sum of the number of different Y2 districts worked on each band (maximum of 15 per band). The districts are indicated by the last letter of the call. Final score is the sum of QSO points multiplied by the total multiplier.

SWLs count 1 point on phone and 3 points on CW for each Y2 call with sent RS(T), 2-digit number, and call of station worked with the Y2.

AWARDS:

Certificates awarded to the leading stations in each section of each country.

ENTRIES:

Separated logs are required for each band. Summary sheet showing multiplier and QSO worked on each band also required. Each log must be accompanied by the following signed and dated declaration: "I declare that my station was operated in accordance with the rules of the contest, and in accordance with the requirements of my amateur-radio license." Logs should be mailed within 30 days following the contest to: Y2 Contest Bureau, RKDDR, Hosemannstr. 14, DDR 1055 Berlin, German Democratic Republic. In the case of any dispute, the decision of the Y2 Contest Bureau shall be final. Applications for awards issued by the RKDDR fulfilled in the contest may be sent together with the contest log and indicated fee.

CLARA AC-DC CONTEST
Starts: 1800 GMT October 20
Ends: 1800 GMT October 21

Sponsored by the Canadian Ladies Amateur Radio Association, the Ac-Dc Contest is open to all YL and OM amateurs. Each station may be worked twice, either once on CW and once on phone, or on two different bands.

EXCHANGE:

Signal reports, QTH, and name. Bonus stations will be operating and will identify as such. Each bonus station may be worked twice, once on CW and once on phone, but it *must* be on different bands.

FREQUENCIES:

Phone—3900, 3775, 7150, 14280, 14160, 21300, 28588, and 28488; CW—3690, 7035, 14035, 21035, and 28035.

SCORING:

CLARA members score 1 point per contact with nonmembers, 2 points per CLARA-member contact, and 3 points per bonus station. Multiply by two for contacts made on CW. Multiply total of the above by the number of Canadian provinces/territories worked for total score. Non-CLARA members count points the same except only CLARA-member contacts are to be counted.

AWARDS:

First-place CLARA cup and certificate to first-place CLARA winner, certificates to second and third. Plaque and certificate to first-place non-CLARA winner, certificates to second and third.

ENTRIES:

All logs submitted are eligible for the mini prize drawing. Mail all logs and scores with your name, call, address, and postal code by December 15th to: Muriel Folsy VE7LQH, RR #1, Pender Island, BC, Canada V0N 2M0.

✓ See List of Advertisers on page 98

73 INTERNATIONAL

from page 60

classes: A, up to 1 kW; B, up to 250 W, and C, up to 100 W. All stations may be either fixed, mobiles, or portables and of three other categories: land, maritime, or airborne. Operators are classified as belonging to any of three categories:

- Superior: able to operate class A stations on all authorized bands.
- *Intermedia:* authorized to operate class B stations on 160, 80, 40, 10, 6, and 2 meters, and in the portions 14.000 to 14.200 and 21.000 to 21.250 MHz.
- Novicio: authorized to operate class C stations in 160, 80, 6, and 2 meters, and in the portion 7.100 to 7.150 MHz.

It is compulsory for all amateur-radio stations to have operational equipment in the 40-meter band. This is to be able to participate at any moment in case of emergency. In this context, it also is mandatory for all clubs and amateur-radio organizations to maintain a schedule of radio watch and frequency control on all bands, under supervision of government authorities.

To get a license you must be Peruvian, either by birth or nationalization. If you are under 18 years old, you must get legal permission. Foreigners also can get licenses if their residence in the country is for more than 5 years, or 3 years if married to a Peruvian citizen or have Peruvian children.

The first license is issued for the Novice class after an examination on elementary electronics and communications and practical station operation. You must remain in that class until you get 100 QSL cards. To upgrade to the next category, you must apply for another examination on radio communications: You must be proficient in radio station operation and must be able to receive and transmit CW at 5 wpm.

You also must remain in that category until you receive another 100 QSL cards. Then you may apply for another examination on advanced electricity and electronic fundamentals, proficiency in radio station operation, and must be able to transmit and receive CW at 10 wpm.

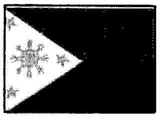
The Novice license is issued for a period of 3 years, not renewable. Thus, you must attend an examination within the next three years for upgrade or your license is cancelled. The other two categories also are issued for periods of three years but are renewable for similar periods. Licenses under a reciprocity agreement are valid for up to 90 days only.

The Direccion de Telecomunicaciones can authorize the installation and operation of amateur-radio stations to the military, radio clubs, and amateur-radio institutions, Peruvian Red Cross, Civil Defense, and scientific institutions in the areas of seismology, meteorology, and geophysics, to be operated *only* by licensed radio amateurs.

Of all the above, it is relevant to note that foreign operators can apply for a reciprocity-agreement license for only 90 days, but if he is a resident, he will get OA prefixes without restriction. Unfortunately not all countries have this prerogative. Also interesting is that amateur-radio stations installed at institutions like Civil Defense or Red Cross must be operated by licensed radio amateurs. In some countries, there are even citizens-band organizations or Civil Defense stations with amateur-radio stations operated by anybody able to press the PTT button.

The above information is based on current regulations, Decreto Supremo 009-74-TC, dated April 31, 1974.

That's all. I hope some fellow Peruvian will continue this writing from here on. In doing so, we'll see again the red and white flag waving in "*73* International."



PHILIPPINES

Leo M. Almazan WA6LOS/DU2
10098 Knight Drive
San Diego CA 92126

In my last column I wrote about the amateur-radio scene in the Philippines today. After a rather nice lengthy QSO with a W7 ham from Seattle, Washington, who happened to be in the Philippines before World War II, he not only told me how they used to DX on 40 meters with RCA's CW rigs, and Arc-88 receivers coupled to high zepp antennas, he also sparked my curiosity about the history of amateur radio in the Philippines.

After talking to the local OT hams in the country, I came up with pieces of information that any wireless nostalgia buff may find rather interesting. In this column I will talk about the history of amateur radio from World War I right up to World War II. In a subsequent column I will deal with the history from World War II right up to the early sixties.

The first wireless station in the Philippines was the powerful US Army spark station on Corregidor Island (made famous by General Douglas MacArthur's last-stand battleground) which was used to guide ships in and out of Manila Bay. The second famous station was the NPO, a US Navy spark station near their Sangley Point Naval Base. Both of these were built about or just before the US had entered World War I.

From this time till late 1919, the amateurs here followed US regulations since the Philippines was a US territory, and transmissions were considered illegal. Not till 1920 (even when the Philippines Legislature did not pass any radio laws till 1924) was anyone given permission by the Bureau of Post to start transmission. Even then, due largely to confusion, amateurs were still using their initials as callsigns. Before the 1920s, the local hams and US service personnel were on the air using whatever parts they could scrounge. Some were using old Ford spark coils, coherers, and galena detectors that were bought stateside from H. Gernsback's E. I. Co. catalog, then considered as the "bible of wireless."

In the early twenties, American hardware stores were *selling "wireless toys"* made by the famous A. C. Gilbert Co. of New York, the maker of the also-famous Erector sets. Each set consisted of an untuned crystal detector, headphones, an indoor aerial kit, ground connector, a key, and a single-circuit heavy-duty buzzer for the transmitter instead of the two-circuit, spark coil. With such sets, neighboring amateurs could play wireless and learn the code by actual communication. No license was required.

In the thirties, several ham stations sprouted in the country. The most notable was KA1HR, a multi-op, 1-kW station at a US Army base in Fort MacKinley. (The "KA" prefix was used since the country was still a US territory.) In the early thirties, the 1-V-2 "superwasp" was considered the standard station receiver. Other home-brewed receivers were built using the type-30 battery tubes. Commercial receivers also were available, like the National SW-2, SW-5, and the HROs.

Most Americans were already using multi-stage, crystal-controlled transmitters as required by US regulations, but the locals were still using self-excited, single-stage rigs.

Antennas were mostly half-wave sky wires, like the voltage-fed zepps with tuned feeders. Some used current-fed Hertz, or the single untuned, off-center-fed Windom antenna.

AM phone started appearing in the mid-thirties, exclusively operated by American hams mostly on 40 and 20 meters, though some were experimenting on 160 meters. Most transmitters were home-brewed and the receivers used were high-quality superhets to ensure stateside reception and to avoid QRM.

DXing remained on 40 meters even though competition from SW broadcasters was appearing in the band. The 40-meter CW bandwidth had been cut from 300 to 150 kHz during the International Radio Conference in Cairo in 1938, but CW DXing was still done primarily in this band. The US west coast came around 10:00 pm, South Africa around midnight, followed by the Europeans in the early morning. The top DX certificate then was the WAC, and many CW DXers had won it during the thirties.

Well this is it for now. Also, words are circulating that the Class B licensees will be sporting a "DW" prefix, so watch out for this new one.

POLAND

Jerzy Szymczak
78-200 Bialogard
Buczka 2/3
Poland

The Board of the SP DX Club issued 18 member diplomas recently. The last diploma number is 323. Every candidate for the diploma must produce QSL cards confirming mutual radio contacts with his own radio station with 75 countries on 6 continents. After a 6-month period, he can receive the diploma if he produces QSLs from 101 countries. Actually, 25 candidates are waiting for the diplomas.

There are 1710 honorary members of SP DX Club. To every European sender who establishes mutual communication with 15 full members, and to every extra-European ham who possesses at least 10 such QSLs, this honor can be done.

The SP DX Club celebrates its 25th anniversary in June this year. Eight SP senders have over 300 confirmed countries. There are 112 SP symbols on SP DX honor list for establishing 200 confirmed radio contacts. Leading radio amateurs of the SP DX Marathon are: SP3DOI (4334 points), SP3AGE (4235 points), SP7HT (4086 points), and SP5EWY (4054 points).

The first Polish winner of the WAC Satellite diploma suggests that Polish senders publish the 10 most-interesting QSOs of every year. On his own first list, he put, among others: the first QSO (April 3, 1983, on 7 MHz CW with SP9EVP, after martial law break), the *first* Polish contact via OSCAR 10 (August 15, 1983, with DJ2RE), and the first contact with Australasia via satellite.

Twenty Polish amateur stations took part in the All Asian DX Contest SSB 1983. The best were SP8EMO on 3.5 MHz, SP9EMI on 7 MHz, SP5LM on 14 MHz, SP7AWA on 21 MHz, SP6DNS on 28 MHz, and SP9ALM on SOMB and SP7KTE on MOMB. Diplomas are awarded these stations.

Polish Scouts radio amateurs are always on the go. On the occasion of the 70th anniversary of Scouting, the Scouts Communication Club organized the Leszno Contest UHF '84 that took place in December, 1983. Sixty UHF radio stations took part in the contest. The best individual stations were: SP6GZZ (2712 points), SP3JBI (1917 points), and SP9MM (1817 points). The best club stations: SP6WCY (1066 points), SP2KFE (169 points), and SP3ZHW (115 points). UHF radio amateurs from Leszno were informed that every Friday (2200 local time) has been set up as an activity day of Leszno stations using radiotelephones. Most of them work on 145.200 MHz with antennas with both vertical and horizontal polarization.

A new Scouts diploma, CZUWAJ, has been established recently. It is awarded by the Wroclaw team, SP6ZDA. To get this diploma one must acquire 50 points and assemble all the letters belonging to the word CZUWAJ (WATCH!). Selected stations send individual letters. Stations with stationary QTHs grant 4 points, and with local QTHs 6 points for every QSO. Eight points are awarded for QSLs with Scouts ceremonial stations. Contacts on UHF are counted double points.

In February this year, the first Polish repeater UHF-FM was set in motion. It has omnidirectional antennas with vertical polarization. The repeater works on the R channel. It receives signals on 145.000 MHz and transmits on 145.600 MHz. A 100-km range for the repeater has been estimated. Its callsign is SR9E.

TRINIDAD AND TOBAGO

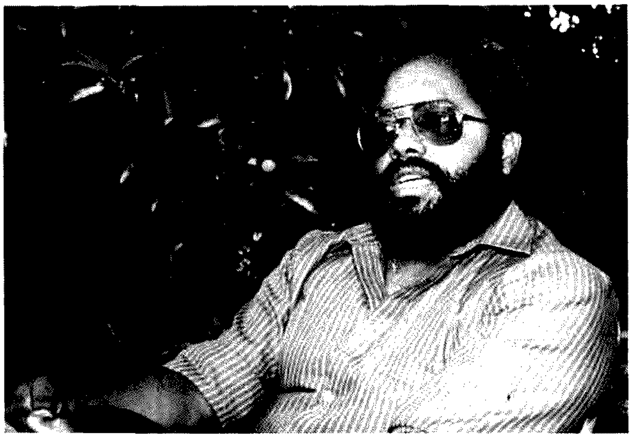
John L. Webster 9Y4JW
c/o Department of Soil Science
University of the West Indies
St. Augustine
Trinidad
West Indies

9Y4RD COMES HOME

On March 24, 1984, Roger de Weever 9Y4RD returned home for a well-deserved three-week vacation. Many of the DXers out there will be familiar with Roger's callsign, which has popped up in the past two years from such good DX locations as SU and STØ, and they may have received his attractive and amusing QSL.

At the monthly general meeting of the TTARS held on April 2nd, Roger was our guest of honor and addressed us for about one hour on his experiences in the Middle East. I was also privileged to have a lengthy (six-hour!) and very interesting eyeball with him about one week later.

Roger, now 35 years old and married to a very attractive lady, Carmen, began his career in commercial radio in 1969 as a ship's radio officer, after graduating from college in England. In 1970, he changed jobs to become a radio technician with TEXTEL (Trinidad and Tobago External Telecommunications). In the ten years that followed, he worked his way up through the company to the position of Acting Maintenance Engineer at the Satellite Earth Station located at Matura, in the northeastern part of the island.



Roger de Weever 9Y4RD.

1979 was the year that Roger made the decision to become a ham. On the strength of his experience both as a ship's radio officer and his technical experience as a communications engineer, he applied for the license and was issued the callsign 9Y4RD—his initials. (Here in Trinidad we are allowed to choose our callsigns, provided it has not previously been issued or otherwise reserved.)

Roger, in 1980, took up a job with the United Nations as a Field Service Officer in communications, to serve in the Middle East, and was based in Jerusalem, Israel. However, in the year prior to his departure, Roger, although only involved in limited activity on the air—mainly local 2m and some 10m DX—devoted considerable time to the training program of the TTARS and helped prepare about 30 students for the annual City and Guilds RAE Exam. Most of the students were successful in the examination, and needless to say, after Roger's departure, he was sorely missed by the TTARS.

In his new UN job Roger found the challenge he had been seeking! He has had to visit and work in such countries as Egypt, South Sudan, and Lebanon and is based in Israel—the world's hot spots! He has been involved in recommendations, design, and establishment of a variety of communications systems, both HF and VHF, in these countries, to assist both the local governments and the UN in their law-enforcement and peace-keeping activities. He is not involved in military communications and says that in spite of being based in one of the world's most turbulent areas, he has always been well treated and shown great respect and never felt that his life was in danger.

Roger's amateur-radio activity from the Middle East began in September, 1982, from Jerusalem, with a /4X callsign. His operation from SU commenced in October, 1982, and when in 1983 he was stationed in STØ for about 7 months, once again his ham equipment was lugged along. The equipment that Roger has used in his activity consists simply of a Yaesu 902 DM and a four-band trap dipole.

One of his ambitions from each of the QTHs he has operated has been to get a DXCC, and he has so far achieved this from: STØ—about 2500 QSOs and 130 countries; SU—9000 QSOs and 185 countries, and 4X—1500 QSOs and 150 countries. Whereas Roger enjoys ham-radio operation from comparatively rare DX locations and will always try to comply with another ham's request for skeds, etc., he detests his operations being referred to as DXpeditions. He does not go on DXpeditions in the Middle East. He is simply working in whatever country he is QRV from, and all his amateur-radio activities are done in his spare time as a form of relaxation.

Incidentally, Roger has been doing quite a bit of badly needed PR work for ham radio in countries such as SU and STØ, where amateur radio is neither understood nor encouraged as a worthwhile hobby. In his job he works alongside many locals, most of them being qualified radio technicians, and wherever possible he tries to educate these persons and any others interested in the benefits and usefulness of this hobby we all enjoy.

One interesting fact revealed during the course of our discussion was the way in which ham-radio activity has assisted Roger in his job. The practical experience gained in antenna performance and construction, propagation conditions both on HF and VHF, and even just the way hams get things done when others fail, have all combined to make him successful in his job. It is especially for this reason that he has always made a point of lugging along his trusty 902 DM, as heavy as it is, wherever he has traveled.

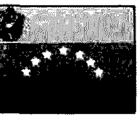
By the time this article appears in print, he will long since have returned to continue his tour of duty in the Middle East. Roger's plans in the coming months include stints in SU and STØ. He already has re-equipped himself with new radio gear. From his home QTH he will be using the new FT-980 by Yaesu and a Cushcraft R3 triband vertical—the one that's ideal for apartment dwellers as it needs no radials! His portable operations will be made with a much more compact and lightweight transceiver, the Icom IC-730, and his old 4-band trap dipole.

Roger has indicated that the following are some of his favorite operating frequencies and times:

14.220 MHz	0700Z
21.157 MHz (DK9KE Net, mainly weekends)	1000Z
21.335 MHz	1800Z
28.550 MHz	1300Z
14.332 MHz (YL system)	Occasionally

All QSLs for 9Y4RD/... should be sent directly to his QSL Manager, KA2DDJ, as he does not have the time nor QSL cards to handle QSLs himself.

Wherever Roger is QRV, you should have no difficulty identifying him, since, as a patriotic Trinidadian, he plans always to retain his 9Y4RD callsign and operate as a portable.



VENEZUELA

Luis E. Suarez OA4KO/YV5
Apartado 66994
Caracas 1061-A
Venezuela

CIRCUITO 2 (YV2)

In Venezuela, call area 2 is composed of the states of Tachira, Merida, and Barinas. The first two are Andean, with cities at altitudes ranging from 100 to 3100 meters. Barinas state, however, is located in the plains on the eastern side of those states and faces the Andes.

San Cristobal is the capital city of Tachira. It is located in a hilly terrain, almost like that of San Francisco. It is a modern city with all the traffic and noise that civilization carries on.

Down the Andes there is another city with a funny name: La Fria (the Cold). When you arrive in that city you will experience tropical heat, but La Fria earned its name from a type of malaria which caused terrible chills and continuous chattering of the teeth. At first it was just some black humor, but the name remained. Today it is a prosperous zone with a superhighway linking this city and San Cristobal. San Cristobal's nearest airport is at La Fria.

Merida, the highest state in the Andes is called the Techo de Venezuela (Roof of Venezuela). Captain Juan Rodriguez Suarez (no relation) founded it in 1558. In fact, he was not authorized to found cities, so he was rushed to Bogota, arrested, judged guilty of the usurpation of Royal prerogatives, and sentenced to be dragged by the tail of his horse until dead and then to be quartered. However, he escaped to Venezuela and got asylum.

In Merida is located the highest mountain of Venezuela: Pico Bolivar. This mountain is 5,700 meters high and wears a perpetual snow dress. It has the highest and the longest cable car in the world; it takes one hour if you go straight to the top. There is some skiing here, but it is not recommended unless you are professional. "It is out of this world, and astronaut training is recommended for the successful Pico Espejo skier" (*Ve Venezuela*).

Driving from Merida city down the plains, and heading to Barinas, is something you'll never forget in your life. At first you go up the mountains to the Andean paramo. It is as inhospitable, cold, cloudy, and damp in the rainy season as it is dry and drab in the dry season. It is so isolated that you feel you are between life and death. You feel the necessity to stop your car and listen to the silence. I did and was surprised to know that the only plants in the zone, the frailejones, are really fragrant and they perfume the paramo.

At Apartaderos, midway between Merida and Barinas, you may visit CIDA, an astrophysical institute, with its four telescopes, among which are Coude Cassegrain, a double astrograph and a great reflector, as well as a Schmidt Camera. Visitors are welcomed.

Continuing to Barinas, you may have direct radio contact now via 2m FM repeaters with Caracas or Maracaibo, as I explained in a past column. Continuing with the trip and heading to Santo Domingo, you see the vegetation begin to change. After Santo Domingo, a snaking road heads you down to the plain. The mountains become green and you see small wa-

terfalls coming near the road. Temperature increases and tropical vegetation breaks all around as you approach Barinas, the capital city of Barinas state.

Barinas is flat and becomes inundated during the rainy season. Since the northwest part of this state is toward the Andes, most of the towns are located in the rolling foothills at the edge of the mountains.

In my next column, I will begin describing call area 3: Lara, Yaracuy, and Portuguesa.

MAP EXCHANGE

I like city maps; if anybody out there is interested in maps, too, let me know. Send me a map of your city and I will enchange with the map of Caracas. Please be sure it is a detailed map with all streets. (Cannot use those which advertise relative locations of historical or interesting places, like tour maps or souvenir maps.) From the USA, Rand McNally is preferred; Dolph is OK. If you know your Maidenhead grid locator (with 6-character precision), please mark your QTH. Otherwise please don't. Let me find it myself!

COMUNICA BULLETIN

Also I wish to mention that I'm publishing a Spanish newsletter named *COMUNICA.* If there is anybody wishing to spread any information to Venezuelan and Latin American radio amateurs, let me know. The bulletin is distributed monthly in all Latin American countries. Subscription is US$15.00 first-class Air Mail per twelve issues. As far as I know this is the first communications bulletin in Spanish ever published and distributed in 19 countries.

If you would like to take a look, send me your address and I will forward you a sample. Maybe you would like to include, with your request, news from your radio club for publication. If somebody is publishing something similar, an exchange is desired. Polish, Chinese, and Swahili bulletins are accepted.

FEEDBACK

I wish to thank all those colleagues who sent cards and letters. All those that requested information and services were replied to or the request accomplished. I have published in *COMUNICA* the requests I couldn't answer in the hope that somebody was able to reply directly.

Regarding the article on parabolic antennas (*73,* May, 1984), I wish to mention that the article was intended to be as tutorial as possible. Really, I have no plans or drawings for construction and the intention was that you personally develop your own design. If you don't have the ability to construct a parabola, neither a drawing or a picture will help.

I guess the best solution is to make the drawing yourself and find somebody who feels comfortable with mechanical structures to help you in construction. Another approach is to get an already-made parabola and to experiment with different feeders. With the information in the article you would be able to know what you get and what you need for your particular application. The last recommendation is that you start with a 1-meter dish and then go ahead with a larger one if necessary.

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

CALLSIGNS

What does your callsign mean to you? I know my call means a lot to me. On the air, it's my name. When I visit hamfests, my callsign badge lets people know who I am. There may be hundreds of thousands of John Edwardses on this sad old planet, but only one KI2U. Thank heaven.

Unlike my name, I've held a number of calls over the years, including WB2IBE (my original), WR2APG, WA2DCS, and of course KI2U. When I upgraded from Advanced to Extra back in 1980, I had to do some serious soul searching before changing my call. My old ID had served me well over the years and, naturally, I was reluctant to make such a drastic change in my amateur-radio lifestyle. Still, a snappy 2 × 1 call has its advantages in pileups, so I reluctantly turned in my old 2 × 3 trademark for KI2U.

ELEMENT 1
MULTIPLE CHOICE

1) Before the FCC reshuffled the amateur callsign allocation process in 1978, what did a WT prefix signify?
   1) A Technician-class licensee
   2) A temporary license
   3) Nothing in particular
   4) A ham in the third radio district
2) WN prefixes were formerly reserved for:
   1) Novices
   2) Interim licensees
   3) Secondary licenses
   4) Repeaters
3) Tuning around 20 meters one night, you hear a station signing KA0QRM. Why do you suspect he is a bootlegger?
   1) The FCC doesn't usually issue call suffixes that are also Q-signals
   2) KA calls aren't allowed on 20 meters
   3) The FCC doesn't issue calls with a Qxx suffix
   4) You don't know
4) What's wrong with WR2APG, New York's favorite 220-MHz slow-scan TV repeater?
   1) It's using an expired call
   2) Repeaters aren't allowed on 220 MHz
   3) Slow-scan TV isn't allowed on repeaters
   4) Nothing
5) What was the callsign of the ARRL's first headquarters station?
   1) W1AW
   2) 1AW
   3) W1ARRL
   4) W1MK

ELEMENT 2
FILL IN THE BLANKS

Fill in the calls of these prominent hams of the past and present:

1) Arthur Godfrey _______
2) King Hussein _______
3) Barry Goldwater _______
4) Mahmud Reza Pahlavi _______ (Shah of Iran's son; now the current Shah)
5) Tom Christian _______

ELEMENT 3
TRUE-FALSE

	True	False
1) The FCC programs its computer so it won't issue obscene or suggestive amateur callsigns.	_____	_____
2) All broadcast stations east of the Mississippi have W callsigns.	_____	_____
3) WHAS is located in Louisville, Kentucky.	_____	_____
4) A broadcast station may select its callsign.	_____	_____
5) OSCAR 8's callsign was W12OSC.	_____	_____
6) Lee DeForest, famed radio inventor, held amateur call 1DF.	_____	_____
7) The FCC issued the first K calls to continental US hams during 1948.	_____	_____
8) W2XAM is *not* a ham callsign.	_____	_____
9) The Federal Radio Commission began issuing W and K calls in 1948.	_____	_____
10) KCBS is located in Los Angeles CA.	_____	_____
11) Hiram Percy Maxim's first callsign was SNW.	_____	_____
12) Marconi once received an FCC citation for failing to properly identify his station.	_____	_____

ELEMENT 4
MATCHING

Match the prefixes in Column A with the countries in Column B.

Column A	Column B
1) CP	A) Grenada
2) LU	B) Sikkim
3) 5H1	C) Philippines
4) LZ	D) Malawi
5) J3A	E) Colombia
6) GU	F) Iran
7) 8R	G) Zanzibar
8) DU	H) Switzerland
9) 3D2	I) Mauritania
10) 5T5	J) Papua New Guinea
11) AC3	K) Ireland
12) VR6	L) Soviet Union
13) HK	M) Sudan
14) M1	N) Bolivia
15) EP	O) Turkey
16) D4C	P) Fiji Islands
17) EI	Q) Guyana
18) CE	R) Bulgaria
19) 7Q7	S) Cape Verde
20) 9V1	T) Singapore
21) 5U7	U) Argentina
22) P29	V) San Marino
23) TA	W) Chile
24) HB	X) Guernsey
25) ST	Y) Pitcairn Island
	Z) Niger

THE ANSWERS

Element 1:

1—2 Usually issued by the local field office when Gettysburg screwed up an application.
2—1 Also KN prefixes for a while.
3—1 Sort of helps to prevent confusion.
4—1 All WR prefix repeater calls have expired.
5—4 It got wiped out in a 1936 flood.

Element 2:

1—K4LIB
2—JY1
3—K7UGA
4—ex-EP1MP
5—VR6TC

Element 3:

1—True All the funny ones.
2—False Most, but not all (e.g., KDKA in Pittsburgh).
3—True All 50 kW of it.
4—True But hams can't. Not fair, really.
5—False Satellites don't require a call.
6—False DeForest wasn't a ham.
7—True During the fall.
8—True It's a call for experimental stations.
9—False The year was 1929.
10—False It's in San Francisco.
11—True Around 1911, the days when you could make up your own call.
12—False Marconi's radio experiments were completed by the time the FCC came into being.

Element 4:

1—N, 2—U, 3—G, 4—R, 5—A, 6—X, 7—Q, 8—C, 9—P, 10—I, 11—B, 12—Y, 13—E, 14—V, 15—F, 16—S, 17—K, 18—W, 19—D, 20—T, 21—Z, 22—J, 23—O, 24—H, 25—M.

SCORING

Element 1:
Five points for each correct answer.
Element 2:
Five points for each call correctly filled in.
Element 3:
Two points for each correct answer.
Element 4:
One point for each correct match.

How did you do?
1-20 points—Called out
21-40 points—Call for help
41-60 points—Call back
61-80 points—On call
81-99 points—A call to remember!

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Your company name and message can contain up to 25 words for as little as $150 yearly (prepaid), or $15 per month (prepaid quarterly). No mention of mail-order business or area code permitted. Directory text and payment must reach us 60 days in advance of publication. For example, advertising for the December '84 issue must be in our hands by October 1st. Mail to 73 Magazine, Peterborough NH 03458. ATTN: Nancy Ciampa.

PROPAGATION

Jim Gray W1XU
73 Staff

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20						20					15
ARGENTINA	20	40A	20	40					10		20A	20A
AUSTRALIA	20	40A		40	40	20	20	20		20	15	15
CANAL ZONE	40A	40A	40	40	40		20	20A	10	15A	20A	20
ENGLAND	40	40	40	40				15	20A	20		
HAWAII	20	20				20	20			15	15	15
INDIA						20	20	20				
JAPAN	20					40	20				15	15
MEXICO	40A	40A	40	40	40		20	20A	10	15A	20A	20
PHILIPPINES							20					
PUERTO RICO	40A	40A	40	40	40	20	20A	15A	15A	20A	20	40A
SOUTH AFRICA	40	40A	20					15A	15A	20A	20A	20A
U.S.S.R.	20	20					20	15			20	20
WEST COAST	21A	20	40	40	40	40	40	20	15	15A	15A	15A

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20				40	40	20	20			15	15
ARGENTINA	20	40	40	40						15A	20A	20A
AUSTRALIA					40	40	20	20	20		15	15
CANAL ZONE	40	40	40	40	40	20	20	15	15A	15A	15A	15
ENGLAND	40	40	40	40				15	15	20A	20	20
HAWAII	20	20	20	40	40		20	20		10	10	15
INDIA	20	20					20	20				
JAPAN	20					40	20	20				15
MEXICO	40	40	40	40	40	20	20	20	20	15A	15A	15
PHILIPPINES	20A	20					20	20			15	15
PUERTO RICO	40	40	40	40	40	20	20	20	20	15A	15A	15
SOUTH AFRICA							10	15A	15	20A	20A	20
U.S.S.R.							20	20A	15	20	20	

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20A	20A	20			40	40	40A	20	20	20	20A
ARGENTINA	20A	20	40A	40						15A	15A	15A
AUSTRALIA	20A	20A	20	20	40	40	40		20	20	15	15
CANAL ZONE	20	20	40A	40A	40			20	20A	15A	15A	15A
ENGLAND			40					20	15	20A	20	20
HAWAII	15	20A	20A	40A	40	40	40	20	20	20		15A
INDIA	20A	20A						20	20			
JAPAN	20A	20A	20			40	40	40A	20	20	20	20A
MEXICO	20	20	40A	40A	40			20	20A	15A	15A	15A
PHILIPPINES	15			20		40	40		20	20		
PUERTO RICO	20	20	40A	40A	40			20	20A	15A	15A	15A
SOUTH AFRICA	20							20	20	15	20	20
U.S.S.R.			40	40				20A	15A	10	20	20
EAST COAST	15A	20	40	40	40	40	40	20	15	15A	15A	15A

A = Next higher frequency band may also be useful.
B = Difficult circuit this period.
G = Good, F = Fair, P = Poor. * = Chance of solar flares.
 # = Chance of aurora.

OCTOBER

SUN	MON	TUE	WED	THU	FRI	SAT
	1 P/F	2 P	3 P/F	4 F	5 F	6 G
7 F/G	8 F	9 P	10 P	11 P	12 P	13 P/F
14 F	15 F/G	16 P/F	17 P	18 P/F	19 G	20 P/F
21 P/F	22 G	23 F/G	24 P/F	25 G	26 G	27 G
28 F/G	29 F	30 G	31 G			

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CoCo SSTV—10

73 QRT? QRX!
Page 8

Dr. DX—76

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

OUR WORST ENEMY

It was back around 1976, shortly after the Carter revamping of the Commissioners, when we hams had our first serious problem with the FCC. In case you are new to amateur radio or are short of memory, here's what happened.

The first problem facing the new Commission had to do with a proposal to eliminate ten-meter linears. This was in response to enormous interference problems from cheap and dirty linears made for CB use on 11 meters, which were proliferating. CB was in its heyday and television sets everywhere were driving their owners crazy as CBers drove by or worked DX from their home locations with their kilowatts.

The FCC had no way of knowing that in a few months their actions would solve the problems in an unexpected way when they expanded the service to 40 channels, almost killing CB entirely.

The situation was severely aggravated when the previous Commission outlawed 11-meter linear amplifiers. This forced the legitimate manufacturers out of business and left it open to underground manufacturers. Clean-emission standards were henceforth ignored and "ham 10-meter" amplifiers flooded in from truckstops and from under CB-dealers' shelves.

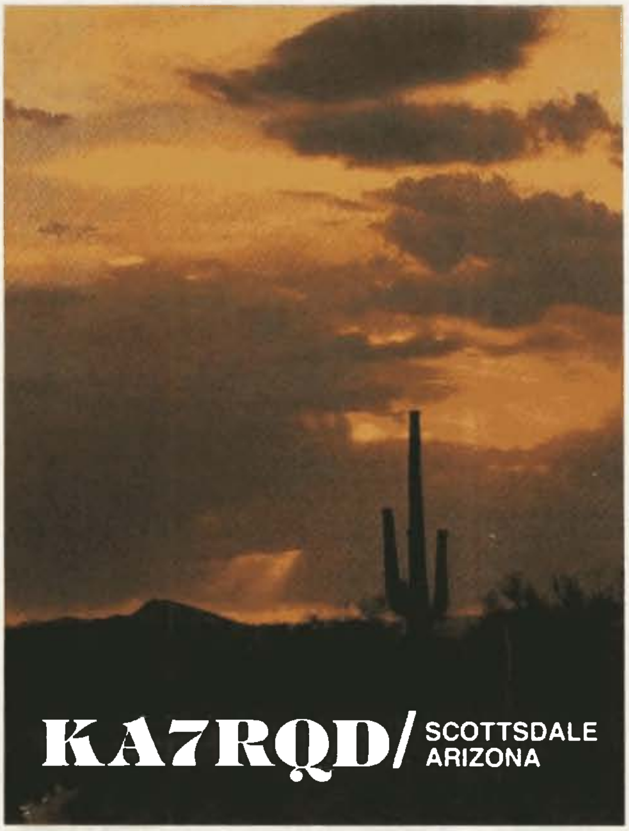
The new Carter FCC held a hearing on whether to outlaw 10-meter linears entirely. The main speaker was the ARRL legal counsel, who proceeded to lecture them like school kids. I watched in mounting horror as Booth went on endlessly while the Commissioners fumed and then walked out on him. That day we lost not only that rulemaking, but all sympathy from the FCC for four years. We were fortunate that they did not follow up on their plan to make a new personal-radio service with CB and ham radio combined.

A Fresh Start

The Reagan FCC gave us a new change in 1981. I went down to Washington and talked with each of the Commissioners personally, giving them some background on the past, present, and potential future of amateur radio. They were eager to help our service get back into a strong growth mode so it could again attract teenagers and thus bring the country desperately needed engineers and technicians—as it had done so well before the ARRL's incentive-licensing disaster of 1963.

Since no-code had been the breakthrough for growth in Japan, they were eager to try it out

Continued on page 82



QSL OF THE MONTH

To enter your QSL, mail it in an envelope to *73*, 80 Pine Street, Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

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QRX . . .

EDITED BY PERRY DONHAM KK2Y

PUBLISHED REPORTS that *73* had been put up for sale by its parent company, CW Communications, Inc., were absolutely true. CWCI felt that *73*, as an amateur-radio magazine, did not fit in with its 50 or so other computer publications. Pro-*73* forces, however, suggested that modern ham techniques, such as packet radio, are indeed high tech and also that selling a successful property might not be a sound idea. CWCI subsequently *withdrew* its offer to sell and committed its *full backing and support* to *73*. As a result, we believe our readers and advertisers will be seeing some exciting improvements in *73* as we enter our 25th-anniversary year!

SOFTWARE PIRATES are looking over their shoulders after Kantronics successfully prosecuted Cindy Gladwell of Cindy's Computer Software. Cindy sold a pirated copy of Kantronics' Hamtext computer program, along with a full set of documentation, to Mike Forsyth at the Michigan State ARRL Convention in Detroit. Mike happens to be Marketing Director of Kantronics. Ms. Gladwell was served an injunction to halt all software-reproduction activities and directed to forfeit $2000 in damages to Kantronics.

THE BID FOR 220 MHZ by several commercial interests has been stalled at press time. The petition by Sideband Technology, Inc., RM-4831, has been put on hold while the FCC investigates charges of conflict-of-interest filed by the Inland Waterway Communications System. Art Reis K9XI, editor of *220 Notes*, has asked for a congressional investigation into the activities of the FCC Office of Science and Technology, which seems to be behind the bid for 220.

THE MOUNT GREYLOCK REPEATER was saved from an untimely demise recently when Governor Dukakis of Massachusetts signed into law a bill giving the Northern Berkshire Amateur Radio Club a twenty-year lease on the repeater site. Overwhelming support from amateurs across the country in the form of cards and letters was instrumental in preserving this heavily-used machine.

A SPREAD-SPECTRUM BEACON is now on the air near Falls Church VA. According to Chuck Phillips N4EZV, the system operates from 144.5 to 147.7 MHz, with a hop rate of 10 per second. Output power is 25 Watts, and the beacon transmits a series of Vs after an identification that is simulcast on the AMRAD repeater, 147.21/.81. After normal business hours, the beacon may be turned on by sending the touchtone™ digits 4-3-2-1 on 144.5 MHz. Chuck has plans for HF spread-spectrum beacons on the 10- and 15-meter bands. If you are interested in the application of this fascinating technique to amateur radio, contact Chuck Phillips at Tactical Communications, Inc., 5711 B Center Lane, Falls Church VA 22041.

PACKET RADIO will be the subject of the next North American Teleconference Radio Net (TRN), heard through over 150 gateway stations across the United States. Two of packet radio's pioneers, Lyle Johnson WA7GXD and Harold Price NK6K, will be the featured speakers. Lyle is president of the Tucson Amateur Packet Radio Society (TAPR) and was the primary influence behind the development of the TAPR terminal-node-controller (TNC) hardware. Harold is a director of TAPR and worked on the software end of the TAPR TNC. For a complete list of TRN gateway stations, send an SASE to TRN Manager, c/o Midway Amateur Radio Club, PO Box 1231, Kearney NE 68847-1231, or check CompuServe's Hamnet XA4 database.

Massachusetts Governor Michael Dukakis chatted with nearly 125 hams after signing legislation saving the Mt. Greylock repeater. That's Warner W1YBT on the right.

SEVERAL ARRL QSL BUREAUS have new addresses.
Third call area: CCARS, PO Box 448, New Kingston PA 17072-0448.
Fourth call area, two-letter prefixes (AA4, KB4, etc.): Sterling Park ARC, Call Box 599, Sterling Park VA 22170.
Fifth call area: ARRL W5 QSL Bureau, PO Box 44246, Oklahoma City OK 73144.
US Virgin Islands: Virgin Islands ARC, GPO Box 11360, Charlotte Amalie, St. Thomas, Virgin Islands 00801.
VE5: VE5 QSL Bureau, B. J. Madsen VE5ADA, 739 Washington Drive, Weyburn, Saskatchewan, Canada S4H 2S4.
VE6: CRRL Incoming Bureau, N. F. Waltho VE6VW, General Delivery, 9714 94th Street, Morinville, Alberta, Canada T0G 1P0.
SWL: Mike Witkoski, 4206 Nebel Street, Stevens Point WI 54481.

THE FAILURE RATE of the new volunteer-given amateur exams is exceptionally high. Most groups report that only 25% of their applicants are upgrading. There's a good deal of confusion regarding who is actually running things—although the *W5YI Report* and the ARRL are both Volunteer-Examiner Coordinators (VECs) for all 13 districts, many districts have up to *seven separate groups* acting as VECs. In some areas, the district VECs are bowing out in favor of the League, which is still trying to bully its way into control of the program. In any case, the FCC will be out of the testing business at the end of the year. For a complete list of VECs, send an SASE to *73*, Pine Street, Peterborough NH 03458, Attn: VEC LIST.

FCC HAS NAILED another jammer. Dave Meehan W7IVK has had his Advanced-class amateur license suspended for one year for willfully interfering with communications on the 40-meter band. After the year is up, Meehan will be permanently barred from operating in the 7235-to-7280-kHz segment of the band.

$140,000 WORTH OF ILLEGAL CB GEAR was seized by US Marshals recently in one of the nation's largest radio-related raids. Most of the equipment consisted of linear amplifiers and subassemblies destined for use in the CB service. The distributor, D&D, Inc., of Shelby NC, faces fines of up to $10,000 and prison sentences for its violation of the Communications Act of 1934.

CONGRATULATIONS TO ROY NEAL K6DUE on his new duties as Deputy Bureau Chief for News Operations for NBC. Roy had previously served as the science correspondent for the network, giving live on-the-air commentary during most of NASA's space shots. Good luck, Roy!

THIS MONTH'S NEWS was courtesy of the *W5YI Report*, *Westlink*, and WA1HXQ.

Color Computer SSTV: Part I

Turn your CoCo into a complete SSTV terminal! How? First, build this high-resolution display system.

Photo A. Multimode display board, showing the physical size of a production display interface. The board has 16K of display memory.

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This two-part article describes a high-resolution display system for the Radio Shack Color Computer® (CoCo). This system provides the CoCo computer with more display capability than any low-cost computer. You might ask why you should use your CoCo to display and generate television images. One answer is, for communications.

Imagine taking your CoCo with a hardware-software interface and connecting it to amateur-radio equipment and transferring a picture to

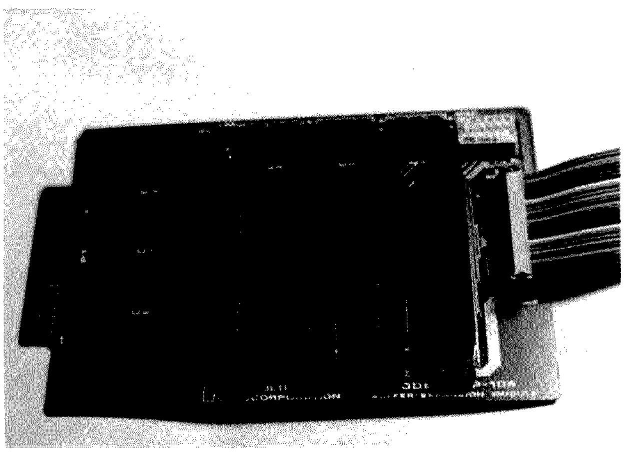

Photo B. Multimode CoCo interface board, which plugs into the expansion interface of the CoCo. A 26-pin flat cable interconnects the interface board and the display board.

someone miles away, or receiving weather-satellite pictures. The digital-television-display field is one which has not been explored by the amateur-computing community, and only a small amount of commercial equipment exists for such applications. In this article, instructions will be provided to construct a card to display high-resolution images and provide interfaces to receive weather-satellite pictures or amateur-radio SSTV.

Before plowing ahead with a lot of technical jargon and confusing terms, some definitions are in order.

Background

In display terminology two terms are particularly important. These terms are used also in television. The first is pixel, and it relates to the smallest element of a picture which can be seen on the TV screen. In normal TV, the pixels are so small that they tend to blend together to form a contiguous image. In digital TV, a pixel is a unit in the picture which can be seen by the unaided eye. Each pixel in digital TV has an intensity or discrete color. The main goal in digital TV is to place the most pixels on a line to form the smoothest image. To do this as well as standard TV does takes a lot of complex and costly circuitry.

The second term is number of lines per picture. In the USA, standard TV has 262 lines per frame or 525 lines per interlaced picture. In digital TV, the number of lines is often reduced from normal TV for cost and simplicity reasons.

If a digital-display system could be developed around a standard microprocessor system, the system would be very versatile. The few commercial display systems which have been developed to date have some disadvantages.

Expandability. Microprocessors have been installed in some of the new display-system designs. All of these units are not user-programmable. Most vendors would rather provide users with new units when their function is to be expanded. If a system were to be based on a commercial microprocessor with a good software base, the system could be expanded as technology progresses.

Fixed Architecture. Most commercial systems are built around a large planar board with lots of ICs and discrete components. These units are designed for a specific application and a limited life span. Adding interfaces like FAX and other applications is difficult. For this reason, the modular approach of functional units connected to a microprocessor makes good sense.

Up to a few years ago, digital TV was not possible. With the explosion of the semiconductor industry, the price of ICs has fallen to a level which makes this economically possible. Most of the early digital TV scan converters used were hardware-only devices. These units were very dumb and

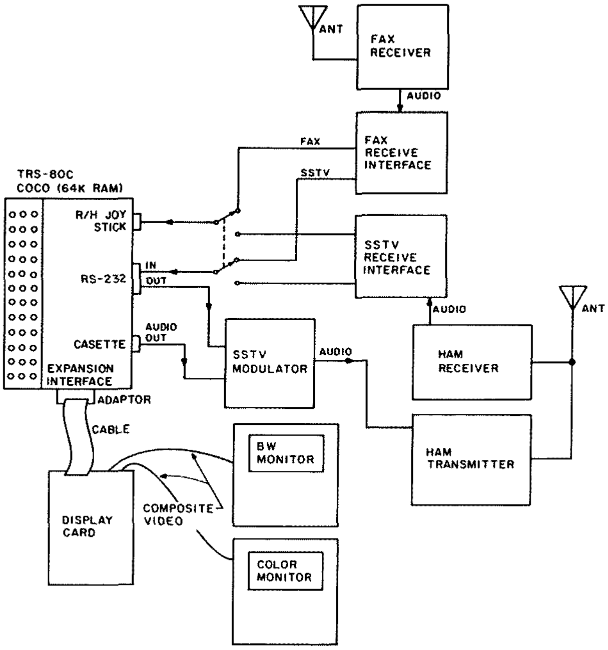

Fig. 1. System block diagram, showing the interconnection of the computer and all the interfaces.

could only generate and display images. The explosion of digital computers and the incorporation of digital displays in computers makes the whole concept very exciting. Once an image is placed in the computer, almost anything is possible: communications, image analysis by computer for manufacturing inspection, medical applications, or art forms for their own sake.

Two applications will be described in this article. The first application is amateur-radio slow-scan television; the second is weather-satellite reception. While the applications are similar in that they require some means of picture displaying and a

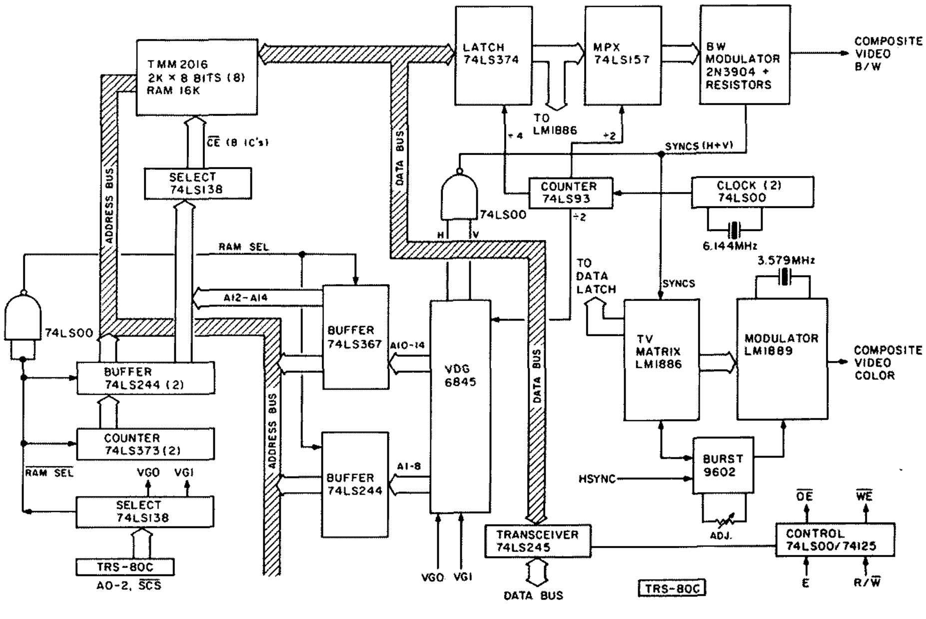

Fig. 2. Display block diagram, showing how the display interface functions. Only the important ICs are shown.

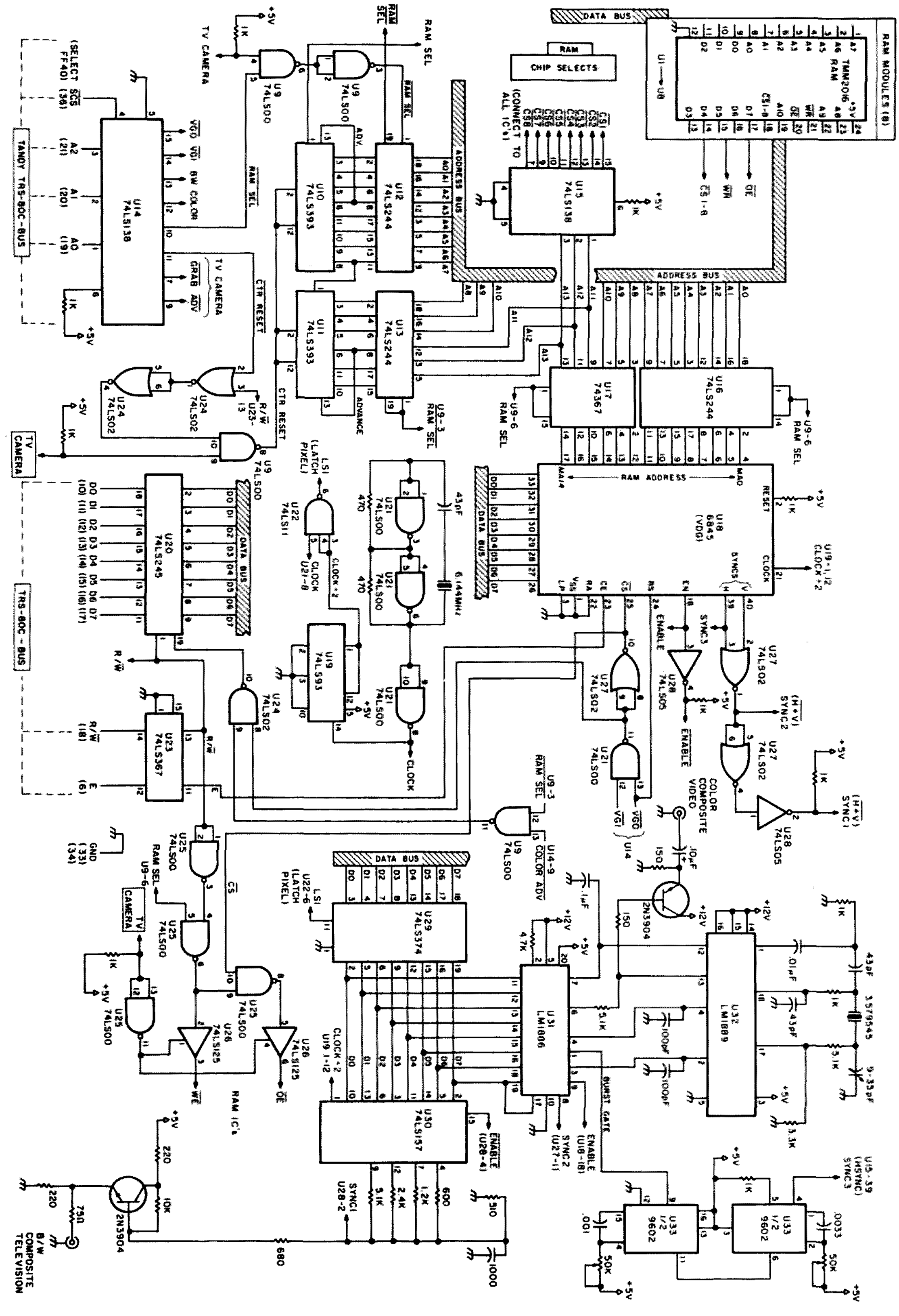

Fig. 3. Display board schematic.

hardware interface to properly condition the signal, and each requires trade-offs and compromises to achieve adequate results, we will treat them separately in order to do an adequate job on each.

SSTV

Since all interfaces use simple hardware, the heart of the system is software. It would be impossible to publish an entire software package in an article of this type. To date, thousands of lines

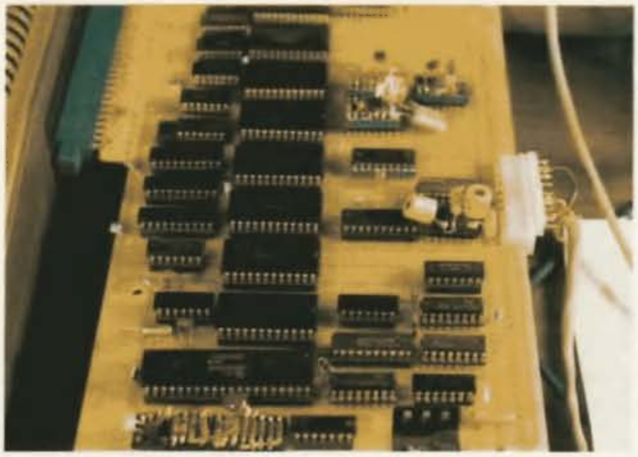

Photo C. The prototype board by K6AEP was one of the first display boards constructed. The board is plugged into a CoCo. The board was point-to-point wired and is exactly like the schematic in Fig. 3. All of these photos in part I of this article were generated by this board. The same results can be achieved by the commercial display boards.

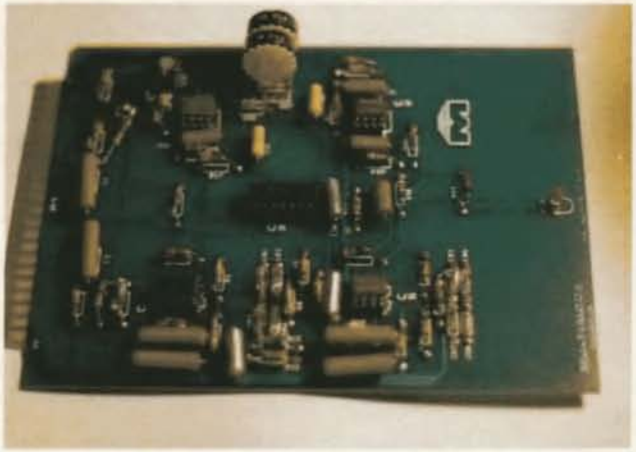

Photo D. A multimode SSTV receive interface. This board is a commercial version of the SSTV receive interface. The physical size is the same as the display board.

of code have been developed. What will be provided here is a technical description of how the software and hardware interfaces function and the steps necessary to develop code. You will find it possible to modify the concepts we present for interfacing with any microprocessor system.

The Display Criteria

Since the main goal of the display card is to produce quality images, it is important to make the picture density as high as possible. This requires the addition of RAM memory in which the image will be saved and displayed. Experimentation by many people over a period of years has determined that a minimum of 128 pixels per line is required for low-resolution images, with at least 16 gray levels. Some experimentation which I conducted in mid-1982 indicated that a minimum of 256 colors per pixel is required to display low-resolution color-TV images.

Armed with this information, a design criteria of 256 pixels per line, 16 gray levels, on 128 lines was defined for black and white displays. This equates to a display size of 16K of display RAM. With a little clever programming and slight reconfiguration of data bits, a total of 256 colors can be displayed for each pixel with 128 pixels per line on 128 lines.

Obviously, a system can be constructed with higher resolution, but as the digital-display density increases so do the cost and complexity. Since this project was created for the average hobbyist with a limited budget, the above criteria seem adequate for today's technolgy.

Hardware Design

It is unfortunate that no off-the-shelf module or design provides the necessary ingredient to display TV-type images. Many manufacturers have developed display-controller ICs for computer terminals, but in most cases they are unusable in TV applications. One of the few ICs which make the job easier is the Motorola 6845. This IC is the heart of the display board and causes the image to be displayed.

The card is designed to attach to the Radio Shack TRS-80C Color Computer, but the design concept is so basic that it can be altered to attach to any microcomputer. The card functions by first generating or placing an image in the main memory of the computer. The TV image can be received through a slow-scan demodulator attached to the receiving equipment then connected to the joystick input of the computer.

Another method of image generation is to attach a special hardware interface to the display card and frame-grab the image into the display card from a TV camera. At this time the TV-camera interface has not been developed. When using the TV camera, the image will be loaded into the video card first and then transferred by computer software to main memory.

System Description

Fig. 1 provides a block diagram of the entire system. The TRS-80C in this application acts as an intelligent controller. All interfaces are very primitive and cannot function without intensive control from the computer. When an image is to be displayed from the receiver, the audio tones are first detected by the display demodulator and converted to two types of signals: sync pulses and a dc voltage which changes as a function of the input audio frequency. These signals are connected to the CoCo's RS-232 input and the joystick input.

The joystick input is actually an analog-to-digital converter which can be used to digitize slow-scan TV video into picture information. All of the operation is controlled by software in the CoCo. When digitized, the pixels are transferred to the display card and immediately displayed. For transmission, the image is first created by software and placed in the CoCo's memory. To transfer the image to a transmitter, the sync pulses are controlled by the RS-232 output line and the video is controlled by the computer's cassette output, which is a digital-to-analog converter.

The above process is true only for black and white television. Color digital TV is more complex. Color TV is developed or transferred from three image planes. Each plane consists of the three prime colors (red, green, and blue). When the three frames are mixed together, a color image is formed. The image can then be transferred to the display card. The transmission method of colored television is either by frame-sequential or by a colored line-sequential multiplexed method.

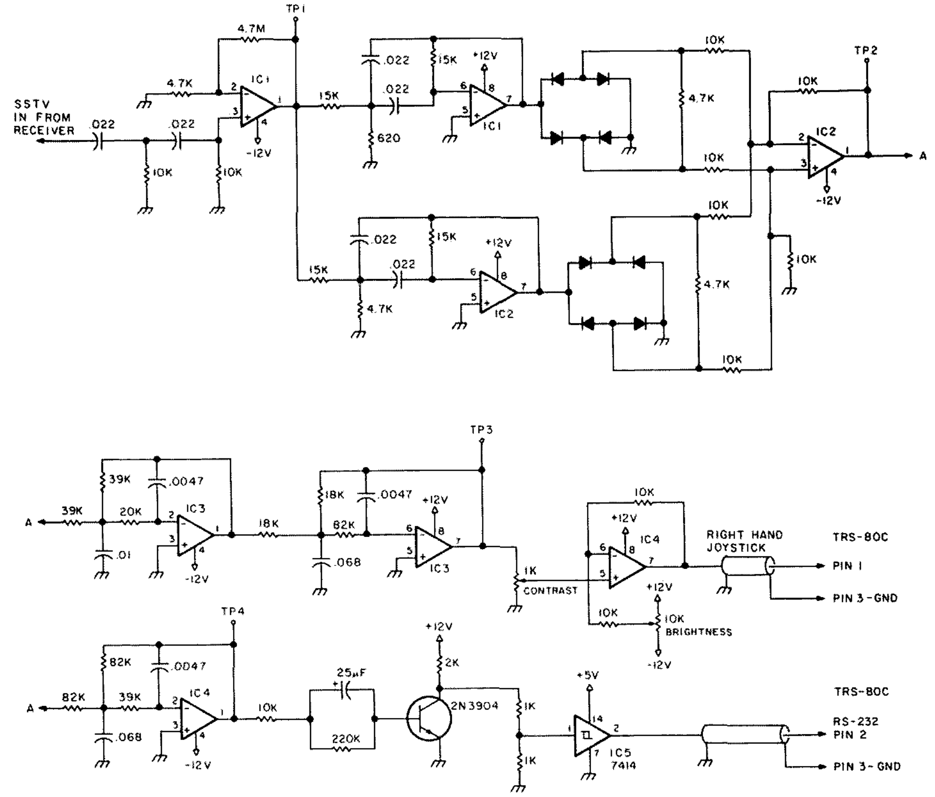

Fig. 4. SSTV/FAX receive demodulator schematic showing a front end which can be used with the computer to display both SSTV and FAX images. The FAX application can be used only on the HF bands.

The block diagram of the display card is shown in Fig. 2 and the schematic is shown in Fig. 3. The following sections describe the major functional parts of the display board.

Display Board

The display board is attached to the expansion port on the side of the CoCo. This port provides connection to the address, data, and control signals of the 6809E MPU. Wiring to the CoCo must be as short as possible; less than one-half-inch leads are a must. The data lines are connected to both the eight RAM ICs and the VDG U18 (6845) display-controller IC through a data bus transceiver (U20). The R-W line determines if the CPU is reading or writing to the board.

In order for the display-controller IC to function, you must first write data to its 18 internal registers. Only three address bits of the 6809 CPU IC are connected to the card. These low-order address bits select the mode which you are performing. The SCS line on the TRS-80C connector is used to select address FF40. The interface E line is the enable signal from the 6809 CPU. This line is used to synchronize the 6845 to the CPU IC for writing to its internal registers.

1. *Functional Selection.* All internal functions of the card are software-selected by a U14 (74LS138). The functions are shown in Table 1 and are described in more detail in the programming section of this article.

2. *Random Access Memory.* This card contains 16K of display RAM (U1 to U8) in eight 2K-by-8-bit ICs. Static RAM was used so as to make the design as simple as possible. Dynamic RAM has the advantage of lower cost but requires extra circuitry to develop RAS and CAS signals, and it is difficult to correct and diagnose problems when they occur. Simple changes can be made to the circuit to add more display memory. Modifications have been made to add 32K RAM. The board can then display 256 pixels on 256 lines, black and white. Television pictures in this mode are starting to approach standard US TV quality pictures.

Control of read or write to the RAM is determined by U25 and U26. During most of the time, RAM is in the read mode. This causes the video data to be valid on the internal data bus. When data is written, it is transferred to and from the CoCo through bus transceiver U20 to the RAM ICs.

3. *Video Display Generator.* The VDG U18 is the heart of the display board. This integrated circuit has 18 registers. In order to make the board operational, the registers must be preloaded before a picture can be displayed on the card. This IC is used to develop the video refresh timings of the RAM. By simply changing the initialization values, either 50-Hz or 60-Hz video can be displayed.

An example of CRT initial-

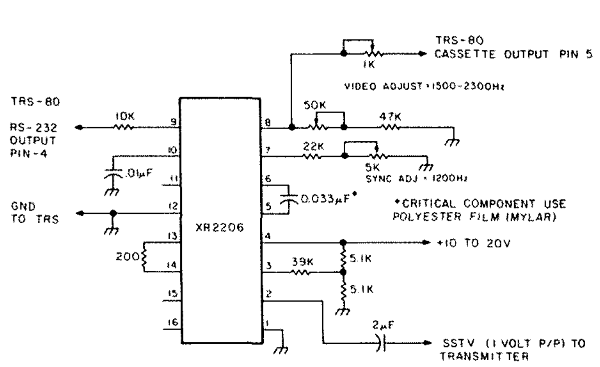

Fig. 5. SSTV modulator, used to transmit SSTV pictures on the HF amateur bands.

ADDRESS	SIGNAL
FF40	VG0 VDG controller address register
FF41	VG1 VDG controller data register
FF42	Spare
FF43	Spare
FF44	Reset—reset RAM address counter
FF45	Select—send picture data to card
FF46	Frame Grab—TV camera—reserved
FF47	Color—TV camera—reserved

Table 1.

```
                    * ASSEMBLER EXAMPLE FOR CODING A PROGRAM
                    * TO RECEIVE SSTV OF FAX WITH A TRS-8ØC
                    * COLOR COMPUTER
                    *
                            OPT PAG
Ø6ØØ                        ORG $Ø6ØØ
                    * EQUATES
               FF45 PORT2  EQU $FF45      DISPLAY A PIXEL
               FF44 PORT3  EQU $FF44      RESET HARDWARE COUNTER
               1ØØØ START  EQU $1ØØØ      DUMMY START ADDRESS FOR PICTURE INFO

Ø6ØØ BE   1ØØØ      RECV   LDX #START     START OF PICTURE IN RAM
Ø6Ø3 8D   49               BSR INIT       INITALIZE MPX IN TRS-8ØC
Ø6Ø5 86   8Ø               LDA #128       256 PIXELS PER LINE
Ø6Ø7 B7   Ø651             STA PIXC       PIXEL COUNTER
Ø6ØA B7   Ø652             STA LINE       LINE COUNTER
Ø6ØD B7   FF44             STA PORT3      RESET COUNTER ON DISPLAY CARD
                    *
Ø61Ø 8D   3B               BSR VSYNC      WAIT FOR VERT SYNC
Ø612 8D   37        RECV1  BSR ADC        GET A READING FROM COCO ADC
Ø614 12                    NOP            EQUALIZE CYCLES TO KEEP
Ø615 12                    NOP            SOFWARE JITTER TO A
Ø616 12                    NOP            MINIMUM
Ø617 12                    NOP
Ø618 12                    NOP
Ø619 12                    NOP
Ø61A 34   Ø2               PSHS A         SAVE ADC ON THE STACK
Ø61C 1ØBE Ø64F             LDY DELAY      PLACE DELAY CONSTANT IN Y
Ø62Ø 31   3F        RECV2  LEAY -1,Y      DELAY LOOP BETWEEN PIXELS
Ø622 26   FC               BNE RECV2
Ø624 44                    LSRA           FORMAT PIXEL INTO RIGHT
Ø625 44                    LSRA           NIBBLE (4 BITS)
Ø626 44                    LSRA
Ø627 44                    LSRA
Ø628 AA   EØ               ORA Ø,S+       ADD PIXELS
Ø62A 1ØBE Ø64F             LDY DELAY      DELAY CONSTANT
Ø62E B7   FF45             STA PORT2      DISPLAY TWO PIXELS
Ø631 A7   8Ø               STA Ø,X+       PLACE A COPY IN RAM
Ø633 31   3F        RECV3  LEAY -1,Y      DELAY LOOP
Ø635 26   E9               BNE RECV2
Ø637 7A   Ø651             DEC PIXC       DECREMENT PIXEL COUNTER
Ø63A 86   8Ø               LDA #128       RE-INT PIXEL COUNTER
Ø63C B7   Ø651             STA PIXC
Ø63F 26   D1               BNE RECV1      DO IT TILL LAST PIXEL
Ø641 7A   Ø652             DEC LINE       IS IT LAST LINE ?
Ø644 27   Ø4               BEQ END        DO IT TILL LAST LINE
Ø646 8D   Ø4               BSR HSYNC      WAIT FOR HORIZONTAL SYNC
Ø648 2Ø   C8               BRA RECV1      DO IT ALL OVER AGAIN
                    *
                    * END THE WHOLE PROCESS
                    *
Ø64A 39             END    RTS            RETURN TO MAIN LINE CALL
                    *   ADC ROUTINE- RECEIVE A PIXEL THROUGH ADC PORT
                    *   JOYSTICKS - PERSERVE THE X AND A REGISTERS
                    *   RETURN WITH ADC VALUE IN A
                    *
Ø64B 39             ADC    RTS            DUMMY RETURN
                    *
                    *    SYNC ROUTINES- SAMPLE RS-232 INPUT PORT AND WAIT FOR
                    *    THE INPUT TO RISE THAN FALL. VERTICAL SYNC SHOULD
                    *    LOOK ONLY FOR PULSES GREATER THAN APPROXIMATELY 3Ø
                    *    MILLISECONDS. IF THE PULSE WIDTH IS LESS THAN APPROX.
                    *    3 MILLISECONDS THEN IT IS A HORIZONTAL SYNC PULSE.
                    *
Ø64C 39             HSYNC  RTS            DUMMY H SYNC
Ø64D 39             VSYNC  RTS            DUMMY V SYNC
                    *
                    * INITALIZE MULTIPLEXER IN COCO TO CONNECT JOYSTICK
                    * INPUT TO THE CORRECT PIN ON THE CONNECTOR. JOYSTICK
                    * INPUTS CAN BE A POSSIBILITY OF 4 PINS
                    *
Ø64E 39             INIT   RTS            DUMMY MPX SELECTION
                    *
                    *  DELAY- CONSTANT TO ALLOW FOR DELAY BETWEEN PIXELS
                    *  VARIABLE TO COVER ALL MODES OF RECEPTION
                    *
Ø64F ØØ1Ø           DELAY  FDB $ØØ1Ø      SAMPLE DELAY
                    *
                    * GENERAL STORAGE FOR PROGRAM CONSTANTS
Ø651 ØØ             PIXC   FCB Ø          PIXEL COUNTER DELAY
Ø652 ØØ             LINE   FCB Ø          LINE COUNTER DELAY
                    *
                           END RECV
```

Fig. 6. Program example for SSTV/FAX receive, written in 6809 assembler language, to demonstrate how easily a receive routine can be written. The routine cannot be executed without software additions.

```
                    * ASSEMBLER CODE EXAMPLE OF TRANSMISSION OF
                    * A SSTV PICTURE OVER AMATEUR RADIO USING A
                    * TRS-8ØC COLOR COMPUTER
                    *
                            OPT PAG
Ø6ØØ                        ORG $Ø6ØØ
                    * EQUATES
               FF45 PORT2  EQU $FF45      DISPLAY A PIXEL
               FF44 PORT3  EQU $FF44      RESET HARDWARE COUNTER
               1ØØØ START  EQU $1ØØØ      DUMMY START ADDRESS OF PICTURE INFO
               FF2Ø PIA    EQU $FF2Ø      DAC PORT (CASSETTE OUTPUT)

Ø6ØØ BE   1ØØØ      XMIT   LDX #START     START ADDRESS TO XMIT
                    * FIRST DISPLAY PICTURE ON THE SCREEN
Ø6Ø3 B7   FF44             STA PORT3      RESET HARDWARE COUNTER
Ø6Ø6 A6   8Ø        XMIT1  LDA Ø,X+       GET A PIXEL
Ø6Ø8 B7   FF45             STA PORT2      DISPLAY IT ON CARD
Ø6ØB 8C   5ØØØ             CMPX #START+$4ØØØ LAST BYTE OF DISPLAY ?
Ø6ØE 26   F6               BNE XMIT1
Ø61Ø 1ØBE Ø655             LDY #TABLE     ADDRESS OF PIXEL TABLE
Ø614 7F   Ø666             CLR LINE       CLEAR LINE COUNTER
Ø617 7F   Ø665             CLR PIXC       CLEAR PIXEL COUNTER
Ø61A 8E   1ØØØ             LDX #START     START OF PICTURE RAM
Ø61D 8D   33               BSR XVERT      XMIT A VERTICAL SYNC PULSE
Ø61F A6   8Ø        XMIT2  LDA Ø,X+       GET A PIXEL
Ø621 34   Ø2               PSHS A         SAVE IT ON THE STACK
Ø623 44                    LSRA           FORMAT PIXELS FOR TRANSMISSION
Ø624 44                    LSRA
Ø625 44                    LSRA
Ø626 44                    LSRA
Ø627 A6   A6               LDA A,Y
Ø629 B7   FF2Ø             STA PIA        XMIT A PIXEL
Ø62C 35   Ø2               PULS A         GET BACK ORIGINAL TWO PIXELS
Ø62E 84   ØF               ANDA #$ØF      MASK OUT HIGH ORDER NIBBLE
Ø63Ø 8D   22               BSR DELAY      DELAY LOOP BETWEEN PIXELS
Ø632 A6   A6               LDA A,Y
Ø634 B7   FF2Ø             STA PIA        XMIT NEXT PIXEL
Ø637 8D   1B               BSR DELAY      DELAY A PIXEL
Ø639 7C   Ø665             INC PIXC
Ø63C B6   Ø665             LDA PIXC
Ø63F 4D                    TSTA           IS IT THE LAST PIXEL ?
Ø64Ø 26   C4               BNE XMIT1
Ø642 7F   Ø665             CLR PIXC       RESET PIXEL COUNTER
Ø645 8D   ØC               BSR XHORIZ     XMIT A HORIZONTAL SYNC
Ø647 7C   Ø666             INC LINE
Ø64A B6   Ø666             LDA LINE       GET NEW LINE COUNT
Ø64D 81   8Ø               CMPA #128      LAST LINE ?
Ø64F 26   B5               BNE XMIT1      NOT LAST LINE
Ø651 39                    RTS            RETURN TO MAIN LINE CALL
                    *
                    * XMIT SYNC PULSES - VERTICAL SYNC WILL BE
                    * 5Ø MILLISECONDS IN DURATION, THE HORIZONTAL
                    * SYNC PULSE WILL BE 5 MILLISECONDS IN DURATION
                    *
Ø652 39             XVERT  RTS            DUMMY ROUTINE
Ø653 39             XHORIZ RTS            DUMMY ROUTINE
                    *
                    * PIXEL DELAY ROUTINE DELAY A SUFFICIENT AMOUNT
                    * OF TIME BETWEEN PIXELS TO XMIT THE CORRECT
                    * HORIZONTAL SYNC FREQUENCY
                    *
Ø654 39             DELAY  RTS            DUMMY ROUTINE
                    *
                    * PIXEL LOOK UP TABLE. CORRECT PIXEL BIT PATTERNS
                    * WILL BE ACCESSED IN THIS ROUTINE TO PLACE A
                    * A VOLTAGE ON THE SSTV MODULATOR TO PROVIDE THE
                    * APPROPRIATE VOLTAGE F=WHITE 23ØØ HZ.
                    * Ø=BLACK 15ØØ HZ
                    *
Ø655                TABLE  RMB 16         16 BYTES OF DATA
                    *
                    * COUNTERS IN RAM
Ø665 ØØ             PIXC   FCB Ø
Ø666 ØØ             LINE   FCB Ø
                    *
                           END XMIT
```

Fig. 7. Program example for SSTV transmission.

ization is contained in the programming section. The initialization constants were chosen to display an image with the minimum amount of tearing and proper centering on a 9-inch RCA Color Trak TV set. The TV set was interfaced to the video card by a Radio Shack rf modulator.

4. *The Master Clock.* The master clock is a crystal oscillator operating at 6.144 MHz and is generated by a 74LS00 U21 IC. This crystal frequency was chosen to display an active picture time of 42 microseconds. The initialization software of the 6845 is used to fine-tune this display time. A counter is used to divide the clock frequency by 2 and 4.

5. *The Internal Data and Address Bus.* The entire card is designed to display an SSTV picture continuously. Since the card must be powered by an external source different from the computer, power can be dropped on the computer and the display will still be active.

When a picture is to be displayed on the card, the refresh process is interrupted for a few microseconds. This causes a small white line to appear on the display. The direct memory access (DMA) scheme used on the card is very simple in principle. Normally the addressing of RAM is from the VDG through two tri-state buffers, U16 and U17. When the CPU writes to RAM, not-RAM select is brought low and the RAM address is generated by two counters, U10 and U11. At this time, VDG buffers U12 and U13 are floated on the address bus and the counter buffers drive the bus. After the RAM has been written, the counter advances to the next address.

6. *Display Data.* The digital display data is latched from the data bus at the correct time by the 74LS374 U24; the black and white is twice the rate of the color. The 74LS374 U39 is latched from the data bus every 650 nanoseconds. This data is fed to both the black and white and color modulators. A multiplexer is used to feed the black and white modulator. The multiplexer 74LS157 U30 is clocked at a rate of 325 nanoseconds, which is 256 pixels per line of SSTV.

7. *Black and White Modulator.* The black and white modulator is fed from the multiplexer, U30, which feeds first the 4 low-order bits (nibbles) then the high-order nibble. The output of the multiplexer is connected to a simple digital-to-analog converter (D/A) which consists of a transistor and 10 resistors.

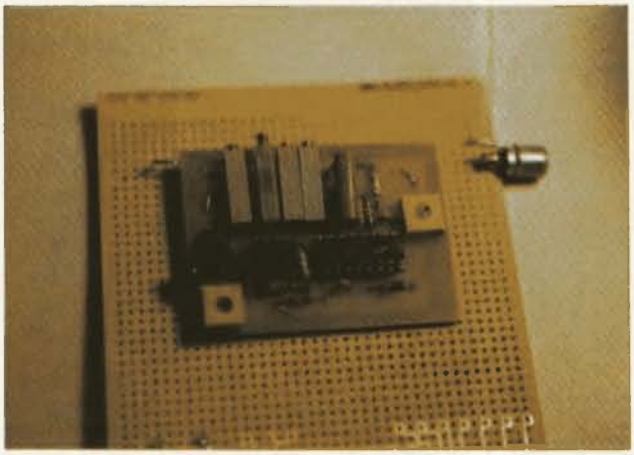

Photo E. RTM Circuit Board's SSTV transmit interface placed on a Tandy prototype card. The card can be plugged into a card cage or a socket for ease of removal and repair.

Sync pulses are generated by the VDG U13, are ORed together by U27, then mixed with video data in the single-transistor D/A converter. Since 4 bits are used, the modulator is restricted to 16 possible gray levels per pixel.

A picture-smoothing capacitor (1000 pF) was placed across the 510-Ohm resistor to ground at the D/A summing point. The value of this capacitor can be optimized to produce the picture most desirable. The absence of the capacitor produces a more digitized picture.

8. *Color-SSTV Modulator.* The color-SSTV modulator consists of three ICs, LM1889 U32, LM1886 U31, and a 9602 U33. The SSTV modulator functions by clocking the picture data on the latch. The data is next transferred to the LM1886 which converts the digital pixels to difference and luminance signals. These signals are internally connected to the color modulator which provides composite color video.

Three additional signals are provided to the LM1886, blanking, sync pulse, and a burst gate. The burst gate is developed from a 9602 which is a dual single shot. The burst gate serves as a reference signal. The location of the burst gate must be adjusted to the correct position on the horizontal-blanking back porch. This is the only adjustment on the board.

```
                    * ASSEMBLER CODE EXAMPLE TO INITALIZE THE CRT
                    * CONTROLLER TO THE APPROPRIATE RATES OF STANDARD
                    * USA 525 LINE TV AND NISC COLOR TV
                    * SLIGHT MODIFICATIONS WILL ALLOW FOR 50 HZ
                    * 625 LINE AND PAL COLOR
                    *
                            OPT PAG
0600                        ORG $0600

0600 5F             INCRT   CLRB
0601 30   8D 000E           LEAX CONCRT,PCR CRT INITALIZATION CONSTANTS
0605 F7   FF40      INCRT1 STB PORT        SELECT REGISTER ADDRESS IN 6845
0608 A6   80                LDA 0,X+        GET FIRST CONSTANT
060A B7   FF41              STA PORT1       PUT DATA INIO REGISTER
060D 5C                     INCB            POINT TO NEXT REGISTER
060E C1   10                CMPB #16        LAST BYTE ?
0610 26   F3                BNE INCRT1      DO IT AGAIN
0612 39                     RTS
                    *
               FF40 PORT    EQU $FF40       CRT CONTROLLER ADDRESS PORT
               FF41 PORT1   EQU $FF41       CRT CONTROLLER DATA PORT
                    *
                    * CRT CONTROLLER IC EQUATES
0613 C0             CONCRT FCB $C0         REG 1  HORIZ TOTAL
0614 80                     FCB 128         REG 2  CHAR/ROW
0615 92                     FCB $92         REG 3  HSYNC POSITION
0616 1E                     FCB $1E         REG 4  HSYNC WIDTH
0617 78                     FCB $78         REG 5  VERT TOTAL
0618 35                     FCB $35         REG 6  VERTSYNC ADJ
0619 7F                     FCB $7F         REG 7  CHAR ROWS/FRAME
061A 01                     FCB $01         REG 8  VSYNC POS
061B 00                     FCB 0           REG 9  INTERLACE MODE
061C 01                     FCB 1           REG 10  SCAN LINES/ROW
061D 00                     FCB 0           REG 11  CURSOR START
061E 00                     FCB 0           REG 12  CURSOR END
061F 02                     FCB 02          REG 13  MSB START VIDEO
0620 00                     FCB 0           REG 14  LSB STOP VIDEO
0621 00                     FCB 0           REG 15  MSB L/P
0622 00                     FCB 0           REG 16  LSB L/P
                    *
                            END
```

Fig. 8. Initialization of the display board; this is an example of how the display board 6845 can be initialized.

The digital data to the LM1886 (U32) is in the format of 3-by-3-by-2 bits of red-, green-, blue-frame information. For example, the lower three bits of the byte are the red-frame information, the next three bits are for the green frame, and the most significant bits are for the blue frame.

This configuration allows for a possible 256 combinations which are unique colors. Since the LM1886 allows for nine bits of digital data to be inputted, the LSB is tied to the MSB of the blue-frame input of the IC to make the bit pattern compatible with the eight-bit display-data bus. This trick allows for black and white images to be displayed. Without this modification, the black and white images would have a blue hue.

9. *TV-Camera Interface.* A number of points are identified in the logic of the display-board interface for the inclusion of a TV camera at a later date. The camera interface will function as follows: When the 74LS00 U9-5 is brought low, the counter will drive the address bus. The TV-camera pixel counter will be incremented by the input U9-9. The RAM read/write is controlled by U26, and the TV-camera input at U25-12/13 will cause the RAM to switch to the write mode. Pixels can next be written to the RAM from the data bus.

Receive Demodulator

The receive demodulator is a device which decodes the SSTV tones into a dc voltage proportional to input frequency and digital sync pulses. This circuit converts video tones of 1500 Hz and 2300 Hz to 0 volts and 5 volts, respectively. A frequency of 1200 Hz converts to a positive digital pulse.

The circuit consists of four stages of filtering and one stage of pulse shaping. Its schematic is shown in Fig. 4.

The decode by this circuit is not only compatible with SSTV but can also be used to decode FAX pictures transmitted commercially on the HF frequencies.

The SSTV video enters the demodulator through the limiter circuit, U1. The limiter is connected to two bandpass filters, U1 and U2, which have bandpasses of approximately 1100 to 2400 Hz. These filters are connected to two diode-discriminator circuits which are combined into a differential amplifier. The signal at TP2 is the carrier frequency of the audio signal with amplitude modulation. The signal in this path with TP3 (U3 and U4) is a series of bandpass amplifiers which allow only the video components of 1500 and 2300 Hz to be passed.

The path of TP4 and U4 is used for the detection and waveshaping of the sync signals. The Schmitt trigger, 7414, is used to develop fast rise times of the sync signals and to produce TTL-level voltages. The sync output from the circuit contains both horizontal and vertical sync pulses.

Modulator Circuit

The modulator interfaces to the CoCo and is the circuit which produces the SSTV audio tones for the transfer of video information in computer memory. The interface, shown in Fig. 5, connects to the CoCo through the RS-232 and cassette-output ports. The cassette-output port is a 6-bit digital-to-analog converter.

The circuit functions as follows. When the RS-232 output is raised, the modulator outputs a sync frequency of 1200 Hz. To generate video tones, a ground

Photo F. A color-SSTV picture displayed on a TI color monitor attached to the K6AEP prototype display board. The picture was received over amateur radio on 28.680 MHz by the TRS-80C and saved on tape. The picture was generated by WB0UNB in St. Louis, Missouri.

Photo G. A color-SSTV picture generated by W0LMD and placed on audio cassette tape and loaded into the TRS-80C. This picture shows the effect of color contouring. Since the display has only 256 possible colors, the shading in the flesh-tone regions are noticeable.

potential is applied to both the RS-232 output and the video input. This causes a video frequency of black 1500 Hz to be outputted. When the video level is increased to approximately 1.1 volts by outputting a digital F to the cassette-output port, a frequency of 2300 Hz is generated. By the use of software, an SSTV picture can be generated by software and transmitted.

The Software

The preceding section provides you with a complete description of the hardware requirements for SSTV applications. Obviously, the hardware performs few useful functions without the software. The intent of the hardware design is to place the burden of all timings and control on the software. This allows for the maximum utilization of all hardware interfaces. There are the following limiting factors.

Microprocessor Speed. The reception or transmission of images is limited by the rate at which the instructions can be executed by the CPU. Fortunately, the 6809 microprocessor is very fast due to its rich instruction set and its ability to process 16-bit data even though the processor is on an 8-bit data bus.

Internal Analog-to-Digital Converter. All of the preceding interfaces are based upon the use of the internal analog-to-digital converter in the TRS-80C. This feature is used to process joystick inputs when playing games. The A/D converter uses a simple successive-approximation technique and is driven by the microprocessor. When this technique is used, the conversion rate is quite slow. The tightest loop which can be written to utilize this feature allows for the conversion of 4 bits of data in approximately 75 microseconds. Even though this is slow, the rate is sufficient to allow for SSTV and FAX reception.

Software Functions

In this section, the software and hardware will be described in a simple, broad, overview approach. The principles described can apply to SSTV, FAX, or any other communications mode which uses a slow rate of transmission or reception. Normally this type of software is called firmware or microcode. Since the software is extremely time-dependent, care must be taken with each instruction written to make the time as short as possible. The description of the software routines will be general enough so that they can be recoded for any general-purpose microprocessor. One important point is that all software must be written in the microprocessor's native assembler language. High-level languages are too slow. Even the most efficient compilers are too slow for SSTV applications.

Receive Software. In Fig. 6 is a simple routine which will receive a picture through an interface attached to the CoCo joystick and RS-232 input ports. The interface can be either the SSTV receiver (Fig. 5) or the FAX receiver (Part II of this article). In both cases the software is identical. The only change in both modes is the delay between pixel reception. The software routines provided are not complete but they do provide an example to readers ambitious enough to learn assembler-language programming. The program functions as follows.

The first six lines of code initialize program constants for the correct number of lines and place the CoCo multiplexer to the correct joystick-input-connector pin. The hardware counter PORT3 is reset to the upper left-hand corner of the picture area. As soon as a vertical sync signal is received on the interface, the program starts to digitize the picture.

The A/D routine converts the analog input voltage to four digital bits and places this information into the lower nibble of a byte. The byte is next placed on the stack, and a software delay is executed. Upon completion of this delay, the next A/D reading is converted. These two values are next added together on the stack, then placed into RAM, and simultaneously displayed on the video card.

The byte in RAM is the same format as the byte on the video card. In the black and white format, the byte

contains two pixels of 4 bits each. In the color format, each byte of the displayed picture has three bits for each color plane except for the blue color. Each time a byte is loaded into the video port, the hardware counter is incremented by one value. This places the DMA address counter to the next location in RAM where the next pixel will be written.

Transmit Software. Fig. 7 contains a simplified example of how an SSTV transmit routine can be written. This example, like SSTV receive, is very general and is provided only as an example to allow for a guideline for development of more complex code.

The software starts off by placing the picture contained in memory onto the display card. This is accomplished by a simple block move of data to the display card. Prior to the block move, the card hardware counter is reset to zero and 16K bytes are taken from RAM and transferred to the video card. Each time the byte is stored at the video-card address, the hardware automatically increments the RAM address to the next location.

The transmission process starts off by issuing a vertical sync pulse. This pulse allows for the receiver on the other end of the transmission path to reset the picture to the top of the screen. In the following steps, a picture byte in memory is loaded into the A accumulator. Each nibble is formatted into the lower nibble of a byte. This byte is next used as an offset to a lookup table in memory which will convert the address to an appropriate digital signal which can be transferred to the D/A converter in the CoCo. This signal will then be transferred to a vco (variable frequency oscillator or modulator) which converts this signal to a sinusoidal frequency in the audio range. This resultant signal is SSTV.

The program continues to transmit pixels until 256 pixels are transmitted. At this time a horizontal sync pulse is transmitted. The program next checks if 128 lines have been transmitted. If so the whole process is terminated. If not, the program continues to transmit pixels.

CRT Controller Initialization. Fig. 8 contains a software routine which will initialize the 6845. The routine takes 16 bytes of data in the table CONCRT and stuffs them into the controller registers. This process is accomplished by first presenting the controller register number to the IC. Next the data byte is loaded into the accumulator then transferred to the card.

The display constants in CONCRT are for a standard 60-Hz display system. To revise the formats to 50 Hz, 625 lines, registers 1 and 5 must be changed. The values should be selected by trial and error.

Hardware Construction

The hardware mentioned above can be constructed on prototype cards or assembled from printed circuit boards. To assemble the display interface on prototype cards takes a lot of work and is vulnerable to errors. Problems experienced with prototyping the card have included: grounds conductors were too small, too few bypass capacitors on power lines, and hardware counters U10 and U11 required a small capacitor on the counter-reset line. Despite these problems, about 5 boards have been constructed to date with excellent results.

Photo A shows the multimode display board.[1] This interface is very compact and its design is slightly different from the one shown in Fig. 3. The board is attached to the computer through a short cable (see Photo B).

Photo C shows the original prototype card constructed by K6AEP. The card was point-to-point solder-wired on a prototype SS-50 computer interface card. A small adapter card was constructed to plug into the CoCo expansion interface. (An etched PC board or completely assembled version of this card is available from L. W. InterFace.[3]

The SSTV receive and transmit interfaces are available in a number of forms. Photo D shows the multimode receive-board interface card; Photo E is a transmit interface from RTM Circuit Boards.[2]

All boards can be placed in a cabinet with the appropriate power supplies of 5 volts (1 Amp) and ±12 volts (100 mA). Cables can be made to attach to the computer and receivers.

Part II of this article will describe the FAX hardware.

Conclusions

The computer approach to displaying images is a very cost-effective method. Most alternative methods available are limited in function and are considerably more costly. The commer-

Parts List

Display Board

ICs

8	U1-U8	TMM2016 or 6116
1	U9	74LS00
2	U10, U11	74LS393
2	U12, U13	74LS244
2	U14, U15	74LS138
1	U16	74LS244
1	U17	74LS367
1	U18	6845
1	U19	744LS93
1	U20	74LS245
1	U21	74LS00
1	U22	74LS11
1	U23	74LS367
1	U24	74LS02
1	U25	74LS00
1	U26	74125
1	U27	74LS02
1	U28	74LS05
1	U29	74LS374
1	U30	74LS157
1	U31	LM1886
1	U32	LM1889
1	U33	9602

Transistors

2	2N3904

Resistors

1	75 Ohms	¼ W, 5%
2	150	¼ W, 5%
2	220	¼ W, 5%
2	470	¼ W, 5%
1	510	¼ W, 5%
1	600	1/10 W, 1%
1	680	¼ W, 5%
8	1k	¼ W, 5%
1	1.2k	1/10 W, 1%
1	2.4k	1/10 W, 1%
1	4.7k	¼ W, 5%
1	5.1k	1/10 W, 1%
2	5.1k	¼ W, 5%
1	10k	¼ W, 5%
2	50k Trimpot	

Capacitors

3	43 pF	Mica
2	100 pF	Mica
1	1000 pF	Mica
1	0.001 μF	
1	0.01 μF	
20	0.1 μF	
1	10 μF	
1	Variable cap, 9-35 pF	
1	Crystal, 6.144 MHz	
1	Crystal, 3.579545 MHz	

SSTV Modulator

1	IC	XR 2206
1	0.033 μF Mylar™	
1	0.01 μF Ceramic	

Resistors

2	200 Ohms	¼ W, 5%
2	5.1k	¼ W, 5%
1	10k	¼ W, 5%
1	22k	¼ W, 5%
1	39k	¼ W, 5%
1	47k	¼ W, 5%
1	1k	Trimpot
1	5k	Trimpot
1	50k	Trimpot

SSTV Receive Interface

4	IC 1-4	MC1458
1	IC5	7414

Resistors

1	620 Ohms	¼ W, 5%
2	1.0k	¼ W, 5%
1	2k	¼ W, 5%
4	4.7k	¼ W, 5%
11	10k	¼ W, 5%
3	15k	¼ W, 5%
2	18k	¼ W, 5%
1	20k	¼ W, 5%
3	39k	¼ W, 5%
3	82k	¼ W, 5%
1	220k	¼ W, 5%
1	4.7 M	¼ W, 5%
1	1k	Trimpot
1	10k	Trimpot

Capacitors

3	*0.0047 μF Mylar™
1	*0.01 μF Mylar
6	*0.022 μF Mylar
2	*0.068 μF Mylar
1	*25 μF Mylar

Small Signal Diodes

8	*1N914

* Or equivalent.

cial units have one advantage in that they can be purchased and plugged into the wall and they are operational. The computerized system described takes a little more work, but it is extremelv flexible and not subject to obsolescence as are its commercial counterparts. The results achieved with the system described here rivaled those of commercial counterparts.

Photo F is a typical color image, 128 pixels per line on 128 lines, 256 colors per pixel. Photo G is another color-SSTV image which shows the resolution of the display board on facial flesh tones. This type of image is the hardest type to display. This picture shows color contouring due to the 256 colors per pixel. Photo H is another color picture with computer-graphics overlays generated by software. The picture is the same as Photo G but reduced in size by one half. The colored image was moved to the center of the display screen and graphical characters of various colors were distributed around the picture.

Photo H. A color-SSTV picture with graphics. This picture is the same as Photo G, but reduced in size by software and placed in the center of the image area. The graphics were generated by software and placed around the picture. The graphics and picture were all generated by the K6AEP SSTV 7.6 Revision 2 program.

Better results can be achieved with 32K of display memory, but photos were not presented in this article for this mode. The black and white images developed by this display density approach fast-scan TV quality.

More photos will be presented in Part II of the article, on the FAX application.

Obviously a project of this magnitude is not a one-person effort. Some of the people who contributed were Ron Adair K5HFT of Multimode Corporation, Bob Blackstock WB5MRG who helped with the display-board design, Larry Fritz AG8O of L. W. InterFace, and Bob Wilson WBØRTM of RTM Circuit Boards. ■

References

[1] Multimode Corp., PO Box 171171, Arlington TX 76016; (817)-572-3996.
[2] RTM Circuit Boards, 205 Elm Street, Van Home IA 52346-0400.
[3] L. W. InterFace, 9570 Kinsman Road, Novelty OH 44072.

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Bradley Wells KR7L
5053 37th Ave. SW
Seattle WA 98126

Wrap Up TVI

Can you endure another evening without transmitting? Use this simple cure to choke out television interference forever.

One of the most perplexing problems for the amateur can be TVI complaints. It seems that no matter how clean your rig, how little power you radiate, or what operating hours you choose, it is only a matter of time before a TVI problem comes home. The best defense against these complaints is the ability to prove you are not ruining your own TV reception. The unfortunate fact of this defense is that few of us can boast of "clean" TV reception while running our transmitters.

After collecting some TVI complaints, most from my own household, a solution to the problem was sought. The original attempt to cure our own TVI problem was the installation of cable TV. This failed miserably and, in fact, enhanced the sensitivity of both television sets to my transmissions. Now, with the capability of jamming every channel day or night, an ultimatum was issued: cure the problem or find another hobby.

Several solutions were tried. The addition of high-pass filters seemed to have little effect on the interference. A new grounding system was installed utilizing multiple copper rods with a braided-copper ground strap run to the rig. This lessened the TVI but did not cure the problem.

Since my efforts were proving less than effective, current literature on TVI prevention was avidly read during my nonoperating time. Despite being hooked up to cable TV, the symptoms appeared to be the result of front-end overloading of the TV receivers. Further reading indicated the probability of inductive coupling between the TV coax and the transmitter. In this case, rf currents are induced to flow in the shield of a coaxial cable situated near a transmitter or antenna. A high-pass filter

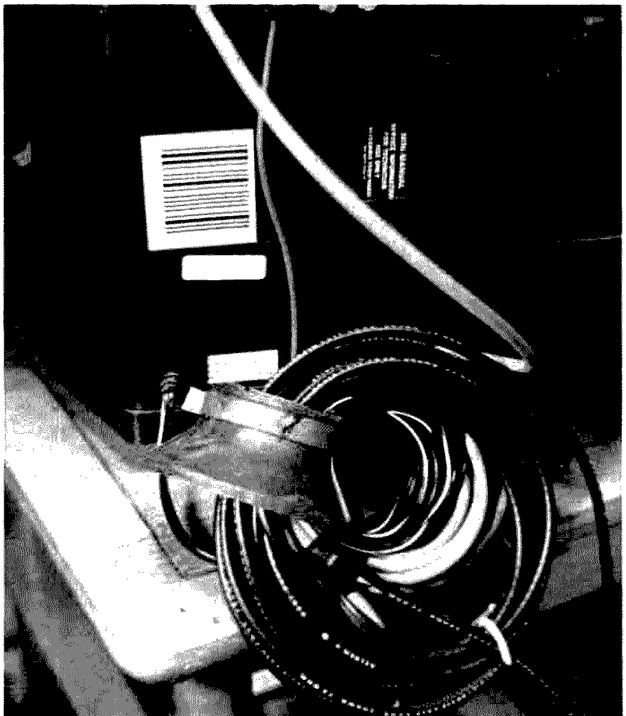

Photo A. The TVI cure in place. The antenna coax and TV power cord are wound in opposite directions through the core to minimize coupling effects.

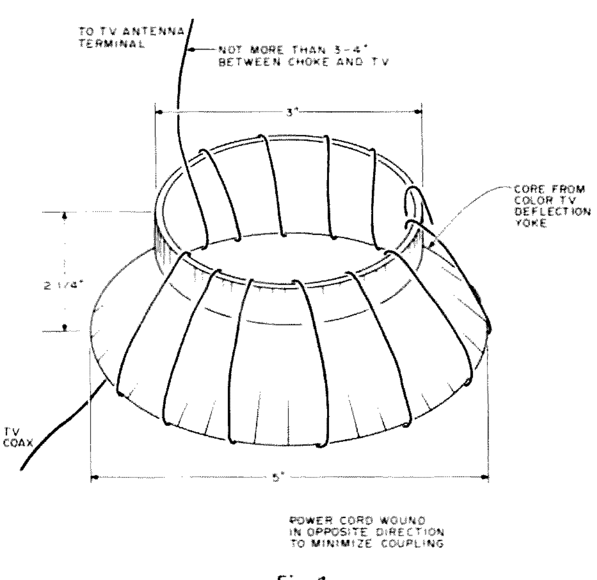

Fig. 1.

is of no use in this situation since the rf current flows down the shield of the coax, through the filter casing, and into the TV.

There are several possible solutions. One is to install a quarter-wave stub at the antenna terminals of the TV, but this is effective for only one operating frequency. A better method is to use a large ferrite toroidal core and wind the coax around it. This functions as a shield choke, preventing rf currents from flowing into the TV, and is effective at all operating frequencies. The only problem with this arrangement is the cost of a suitable ferrite core. They are typically $10.00 to $15.00 apiece.

A less-expensive alternative was sought. Remembering that picture-tube deflection yokes have a toroidal core, several were picked up from a local TV repair shop. They were obtained free of charge, being defective units that had been replaced. The copper windings were stripped off revealing a large, bell-shaped split core bound together with a metal strap. The TV coax was coiled around this core in the same manner as winding a toroidal transformer (Fig. 1). Three inches of cable was left free for attachment to the television. This placed the homemade choke as close as possible to the TV antenna terminals to minimize unwanted rf pickup.

The results were truly gratifying. With the transmitter running at full power, only a faint cross-hatching could be discerned on the picture. Next, the television power cord was wound around the ferrite core in the same manner as the coaxial cable. At this point, all symptoms of interference vanished. Even with one television operating a mere four feet from the transmitter, the picture and sound remained crystal clear.

The same setup was tried with the stereo system in an attempt to achieve the same spectacular results. The speaker leads and the power cord were wrapped around the core in the same manner as with the television. Again it worked beyond all expectations. "CQ CQ from KR7L" was never heard on it again.

This system will not cure every TVI or RFI problem you might have. If your transmitter is spewing out harmonics or other spurious radiation, you need to go to work on the rig, not the television. On the other hand, this method will cure simple overload problems and the cost can't be beat. The TV repair shops in my area were more than happy to give away all their old, defective deflection yokes.

Now when the neighbor comes over to announce that I'm pulverizing his TV, I set him down in front of mine while I fire up the rig. A short demonstration results in profuse apologies and a willingness to listen to some solutions. In addition, I can rest assured that I am free to operate when and where I choose without disrupting the family's favorite TV programs. ■

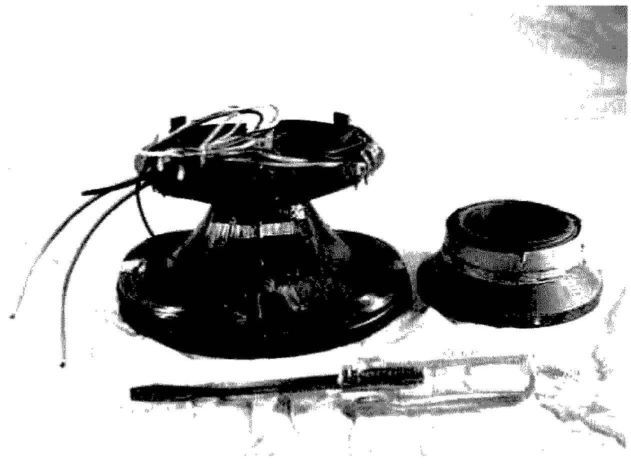

Photo B. The ferrite core is removed from the deflection yoke by releasing the metal restraining band or by cutting the masking tape that holds it in place.

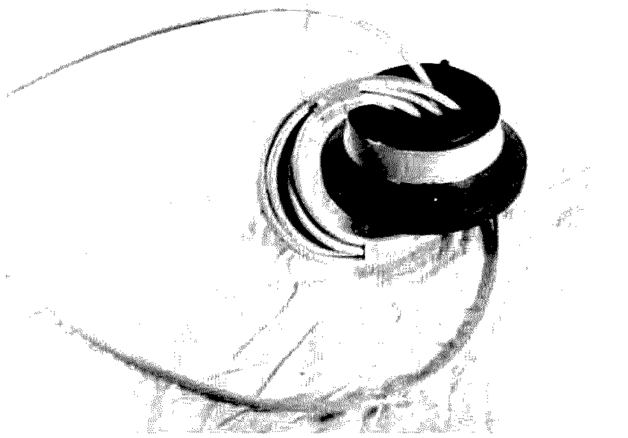

Photo C. The correct method of coiling the TV coax through the ferrite core.

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John P. Burke WD4S
1135 Nova Terrace
Titusville FL 32796

But I Know How To Solder!

Anyone can dribble hot metal over a joint, but it takes an artist to really solder. Are you a Picasso or a pig?

Do you? Do you really know how to solder? We have all seen good and bad soldering in commercial products, from the small battery-operated AM radios and their atrocious workmanship to high-quality and reliable products both domestic and foreign. Most of the amateur-radio equipment manufacturers have rigid quality control which ensures that you are getting a good product.

But how about you? Can you duplicate their results when you work on that home project? And when it's finished, do you stand back and look at it with a feeling of accomplishment or do you say "good enough for government work," as long as it works?

Then and Now

Let's look at this process of joining two pieces of metal together by the use of a solder alloy. It's one of the oldest known joining techniques and probably the least understood by most hams. Believe it or not, it was first developed in ancient Egypt; the technology has advanced to such a degree today, however, that even to mention its origin would be like comparing the first crystal set to the modem-day receiver.

Today, in the field of electronics, soldering is far from the simple task it was in the early days of radio. It could be considered a fine art and one that requires experience, a thorough knowledge of fundamentals, and great care. Faulty solder joints still remain the chief cause of equipment failure.

What is presented here will cover *basic* soldering for electronics and certainly does not represent the details which should be covered for one to become skilled. It should provide you with the fundamental knowledge needed to perform soldering operations with a fair degree of reliability. It will cover the fundamentals of solder action, the selection and proper use of the soldering iron, and some clarifying definitions. It will not cover the accepted procedures for soldering wires and components to single-sided, double-sided, and multi-layer circuit boards.

All aerospace contractors have in-house training programs that are a certification requirement imposed on them by NASA. These go into great detail and are quite lengthy. To cover these related requirements would fill a book, but the average amateur has no use for information on a "PWB lapped termination, a PWB stud termination, PWB clinched termination, turret terminal termination, or a bifurcated terminal termination." This subject can get very dry after about a week, and just a little bit goes a long way.

So, the key word here is *reliability*. High-reliability soldering has been an answer to early failures in space equipment and the

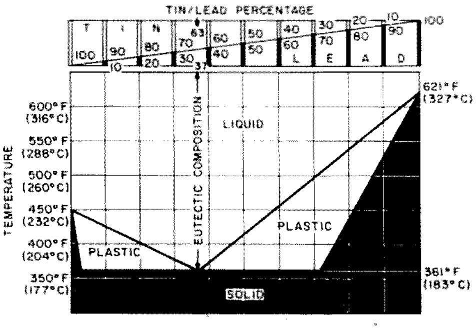

Fig. 1. Fusion characteristics of tin/lead solders.

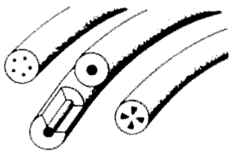

Fig. 2. Types of cored solder, with varying solder-flux percentages.

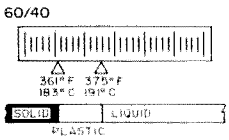

Fig. 3. Plastic range of 60/40 solder: Melt begins at 361° F and is complete at 375° F.

concept has spread to include aviation, weapons, and medical equipment. Today, we expect this reliability in every-day electronics as well, from your hand-held to receivers with complicated bells and whistles.

General Considerations

In order to form a continuous electrical path that will ensure a good contact, one that vibration and mechanical shock won't loosen and will not be subject to oxidation or corrosion, we must solder it according to accepted standards. Look at Fig. 1; it details the fusion characteristics of tin/lead solders. Notice the melting point of lead and tin and their different alloys. These will be discussed later in more detail.

The term "soldering" generally means "soft soldering," which simply means a method of joining two metals together with an alloy of relatively low melting point, usually composed of tin and lead.

Common soft solder used by all of us at one time or another comes in ribbon, wire, and bar form. Wire solder may be either solid or tubular with a core (or cores) of either acid or rosin soldering flux. Bar solder is always used with heavy irons or with blow torches, plumbing, and large sheet-metal work. Ribbon and wire solder are used with light irons on electrical wiring and other small jobs, as shown in Fig. 2.

Solder is designated by numbers; the first number represents the proportion of tin and the second number the proportion of lead. 60/40 solder means a solder that is composed of 60% by weight of tin and 40% by weight of lead. A common solder for all-around use is 50/50 or "half and half." There are others for a more specialized use. Soft solders for gold and silver and for copper and brass sheet generally contain more tin than lead and melt at a low temperature.

So-called liquid solders, or "cold solders," usually are not solders at all but are cements or glues fortified with aluminum or other metallic powder. Avoid trying to make a metal-to-metal bond with these products. They are not electrically conductive and they may disintegrate in the presence of organic solvents or at temperatures considerably below the softening point of tin and lead solders.

The Need for Fluxes

What does the application of flux do? Why do we need to apply flux to a surface to be soldered? In order for the solder to adhere to the metals to be joined, the surfaces must be completely free of oxide. Oxides are present on most metals; they form at room temperatures but almost immediately when heated. A coating or some material must be used that will remove the film already present and protect the solder and the metal from further oxidation. Such a material is flux. It is a Latin word, and it means "to flow."

Except for electrical work, the fluxes most commonly used for soft soldering are solutions of pastes that contain zinc chloride or a mixture of zinc and ammonium chlorides. The heat of the soldering operation evaporates the medium containing the chloride flux. The flux then melts and partially decomposes with the liberation of hydrochloric acid which dissolves the oxides from metal surfaces. The fused flux also forms a protective film that prevents further oxidation. These fluxes are called "acid fluxes" and come in both liquid and paste form.

It goes without saying that acid fluxes have a corrosive action and most certainly should not be used to solder electrical connections. On printed circuit boards—and if it is necessary to wipe the surface with flux prior to soldering—it would certainly be wise to use a good grade of flux and one that can be removed completely.

Some assembly procedures recommend that all solder pads be wiped with a coat of flux. This is a bad practice. It is hard enough to remove the last traces of excessive flux and its residue without damaging the printed circuit board or the installed components. If there is adjacent wiring attached, there is always the danger of rosin flux wicking into the wire between the conductor and the insulation, which would not be removed when the board is cleaned.

Always use a good grade of solvent to remove the unwanted flux and its residue. Ethyl alcohol, isopropyl alcohol, trichorotrifluoroethane, or tricholoethane can be used. A mixture of about 90% isopropyl alcohol and 10% naphtha is excellent for most work.

An acid brush with about half of the bristles cut away makes an effective tool to remove the flux and residue. Rub gently but firmly, taking care not to press too hard, until all traces of the flux are removed. In some cases the joint can be polished using several thicknesses of Kleenex.

Solder

Rosin core solder, when heated to its melting point, undergoes several changes which should be noted in order to make a good joint. It is solid to begin with, changes to a plastic, and then changes to a liquid form. Pure tin melts at about 450° F and lead at 621° F. It would seem that a 50/50 alloy would therefore become liquid at about 535° F. Not so. 50/50 is a solid until it reaches a temperature of about 361° F. At this point it

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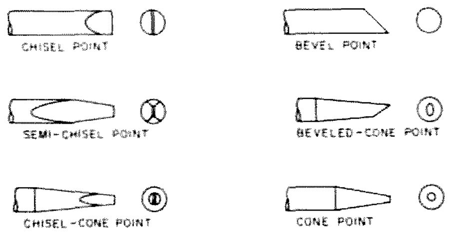

Fig. 4. Tip types.

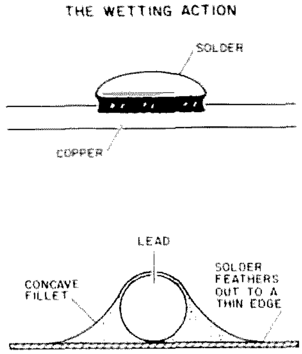

Fig. 5. Molten solder dissolves and penetrates a clean copper surface forming an intermetallic bond.

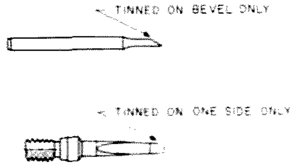

Fig. 6. Selected tinning.

becomes plastic and remains in this condition until it reaches 415° F when it becomes liquid.

Let's take 60/40 (see Fig. 3). At 361° F, 60/40 changes from a solid to a plastic and remains in that state until 375° F when it turns into a liquid. The time that 60/40 remains in a plastic form is considerably less than the 50/50. If the joint is moved while the solder is in a plastic state, it could well be described as a disturbed joint. It might check out with your meter, but when an electrical load was applied, it could fail to conduct.

Let's take another case: 63/37 alloy. This is what is called an eutectic (low melt) composition. It is 63% tin and 37% lead. It has no plastic state and is transformed from a solid to a liquid at 361° F. 63/37 is most generally used on printed circuit boards. It can be seen that this would have an advantage since the plastic state does not occur. Also, the importance of the soldering-iron tip temperature suddenly takes on a new meaning.

Heat Sources and Tinning

A temperature-regulated soldering iron is a must when soldering printed circuit boards. A 50-Watt iron can easily be regulated with a variac or a homemade voltage regulator using a light-dimming rheostat. The temperature can be adjusted to suit the need of the joint to be soldered. The larger the mass, the more temperature will be required. Start with a low temperature and gradually increase it until the desired result is achieved.

The geometric shape of the soldering tip controls the rate of heat flow to the extreme point of the soldering tip. Two main considerations should be made in choosing a proper tip point: access to the solder joint and maximum *wetted* contact of the tip point with the joint members to be soldered. Because of high component density, one often is restricted to just one or two shapes. The standard soldering tips are shown in Fig. 4.

Let's look at Fig. 5 and consider that word "wetted." Wetting is the flow and adhesion of a liquid to a solid surface. It is characterized by smooth, even edges. In other words, a tip that is hot and tinned and ready to do its job. Conversely, de-wetting is a condition in a soldered area in which the liquid solder has not adhered intimately to the joint or, in this case, the solder tip.

Selected tinning (Fig. 6) is an important consideration in certain soldering operations and the point should be tinned on one side only. There is a good reason for this: There is less chance of disturbing an adjacent joint with the immunized side of the tip's point. When a soldering iron is removed from its holder, the soldering tip should be cleaned on a wet, sulfur-free cellulose sponge. The wet sponge will provide a thermal shock to break free and remove secondary oxides from the surface of the tip.

A tip will de-tin or de-wet, and degradation (or the start of oxidation) of the tinned areas will start when the solder begins to ball up on the tip. Once this action has started, it usually will continue until the tip will no longer wet with fresh solder and makes a dry contact with the work. Then the operator will believe the iron is not hot enough. This can all be avoided if the tip is tinned after each soldering operation and prior to placing the iron in its holder.

Another cause of de-tinning is an excessively high tip-idling temperature at which the solder oxidizes faster than you are able to replenish the tip with fresh solder. At high temperatures the flux usually burns and carbonizes, further adding to the de-tinning of the tip. Two simple axioms should be remembered:

1) Solder at the lowest practical temperature, and
2) Keep your soldering tip tinned.

Stranded wires may be tinned very simply if you keep in mind the mass they present to the soldering iron. In other words, the larger the wire, the larger the soldering iron. For example, suppose we wanted to tin a 22-gauge wire and a 14-gauge wire. Both could be handled the same way, with a couple of exceptions. A small, 25-Watt iron with a tip temperature of about 500° F would be sufficient for the smaller wire. However, in order to tin the larger wire, an iron of at least 100 Watts should be used but with the *same* tip temperature.

To tin, place a drop of solder on the tip, place the wire in the solder, and add solder to the top of the wire so that it sweats completely and through the strands. Move the wire slowly along the length to be tinned while adding solder constantly until the strands are thoroughly wet with solder.

Another way to tin wires is called the "reflow" method. Tin your wire in the usual way and note if it has surplus of solder on the wire and separate strands cannot be distinguished. Reflow can be accomplished by raising the iron temperature considerably, then dipping the soldered portion of the wire into flux (a good grade of rosin flux) while wiping the tip rapidly on a wet sponge to shock off the oxides. Very quickly hold the wire in a vertical position and place the tip of the wire on the soldering-iron tip. The excess solder will be removed and will flow to the soldering-iron tip, and the wire strands will be visible. The wire will be thoroughly tinned and will not "birdcage" when bent.

A Word to the Wise

Use a thermal shunt or a heat sink whenever installing heat-sensitive components like transistors, flat paks, or integrated circuits. It is very easy to damage these items with excessive heat. When trimming transistor leads for installation on your favorite PC boards, grip the lead to be cut with needle-nose pliers between the transistor case and the

point where you cut. The energy that makes the unused end go flying across the room can also be expanded in the opposite direction and can fracture the connection inside the housing easily . . . scratch one transistor.

Definitions

Cold solder joint: An unsatisfactory connection resulting from de-wetting or movement of the conductor during cooling. Also caused by too rapid cooling (like dousing it in water). These joints usually appear frosty and granular. They will show up as an intermittent when you least expect it and will drive you up the wall. When checked with your trusty meter, they show good continuity, but when an electrical load is applied, things will change from time to time.

Plated-through hole (PTH): An interesting thing to look for on printed circuit boards. This is a plated-through hole formed by the deposition of metal on the inside surface of the hole. (Also known as a supported hole.) It is used to provide additional mechanical strength to a soldered termination and/or to provide an electrical interconnection on a multilayered printed wiring board. Use extreme care whenever removing a component from one of these. You could loosen it up on one side and it would still be solid on the other side. It is best to use solder wick here or a solder sucker and remove all the solder.

Rosin solder joint: A connection with entrapped rosin flux. The only recourse is to re-solder—carefully.

Solder icicle: Most generally noted on small imported hand radios. It is a cone-shaped peak or sharp point of solder usually formed by the premature cooling and solidification of solder upon removal of the heat source. High-speed production causes this unsatisfactory condition. If the operator worked that fast, it makes one wonder what other bad practices he was guilty of. Be suspicious of the whole unit if this is noted.

Things to Remember

- Flux is very corrosive at solder-melting temperatures, which accounts for its ability to remove oxides. If you must use flux, use a good grade. Kester No. 1544 is a good grade for almost all electrical and electronic soldering.
- Vary the voltage input to your soldering iron and thereby control the tip temperature. Also choose a soldering iron that is matched to the thermal mass you wish to solder. Light work, light iron; heavy work, large iron.
- If the iron tip is too large for the work and too hot, the heating rate will be so fast that it cannot be controlled. If the tip is too small, the heating rate will be too slow. A good rule to prevent overheating is to *get in and out as fast as you can*. This simply means using the hottest iron you can react to, or one giving about a two-second contact on the joint being soldered. Caution: Too much heat, too much pressure, too many times on a printed circuit board—even on the very best board—will lift the pad.
- Always remove the flux and other impurities. Keep it clean . . . clean . . . clean!
- Finally, some soldering irons are simply not compatible with transistors and integrated circuits. They are not isolated from ground and can easily zap everything you solder. Choose well.

I would like to acknowledge the encouragement and help of Merv Holmberg KQ1G. His constructive comments and enthusiasm made research a pleasure. ■

Free-Form Filter Design

Build the ultimate audio filter: high-pass, low-pass, bandpass, notch, variable Q and cutoff frequency, all in a single circuit. Circuit? Sorry, that's single chip!

Jonathan A. Titus KA4QVK
PO Box 242
Blacksburg VA 24060

Many hams use filters to block interfering signals so that CW, phone, and RTTY transmissions can be copied better. Crystal filters are used in many modern transceivers in i-f stages, and add-on audio filters are available from many manufacturers. Most audio filters don't vary much in their design, using operational amplifiers (op amps), resistors, and capacitors to put together active-filter building blocks. These have been described in many publications, and a typical filter is shown in Fig. 1. Common audio filters are low-pass, high-pass, bandpass, and notch. See Fig. 2 for typical frequency response curves.

Circuits are available if you want to build your own filter. Articles in *73*, *QST*, and other ham magazines as well as sections in *The Radio Amateur's Handbook* provide circuit details.[1,2,3,4,5] Most of the parts are inexpensive and readily available, but if you want to look at off-the-shelf filters, they are available from many manufacturers. The MFJ-720 is a typical bandpass filter, centered at about 750–800 Hz. Standard filter circuits can be duplicated, and by using several filter stages in series, you can get a fairly narrow bandwidth. You also can buy a filter such as the M and M Electronics MSB-1, which contains all of the filter types. Even more complex and expensive filters, such as the Datong frequency-agile audio filter, are available.

Integrated-Circuit Filters

If you decide to build your own filter circuits, you might consider using the AF-100 integrated circuit from National Semiconductor. This "chip" contains three op amps preset in a basic filter circuit. By adding a few external components, bandpass, low-pass, and high-pass filters can be built. A "spare" op amp in the chip is used if you want to build a notch filter. Filters are easy to set up; a few calculations are needed to select the right combination of resistors and capacitors, but the math is simple. There is a 20-page data sheet available that explains the types of filter functions that can be obtained, and several examples show how to use this filter chip. There is also an AF-150 universal wideband active filter and an AF-151 dual universal filter.

One of the limitations of most of the standard filters is that you can't easily change the cutoff frequency once the filter has been built. For example, in a filter with four op amps, you would need to carefully vary at least four resistors to change the cutoff frequency.

By the way, the term cutoff frequency is used a bit loosely, since low-pass and high-pass filters have a cutoff frequency, while notch and bandpass filters have a center frequency. Since it's cumbersome to say both,

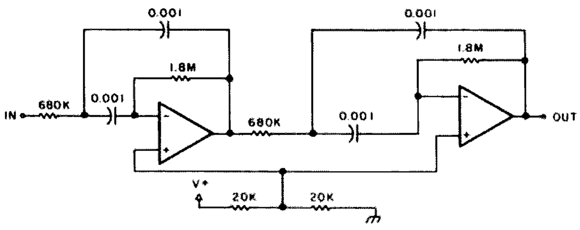

Fig. 1. A typical op-amp bandpass filter for 750–800 Hz.

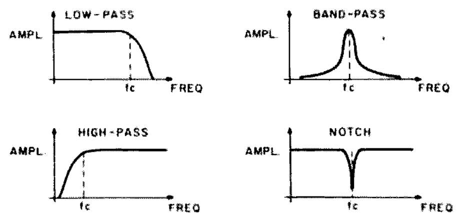

Fig. 2. Frequency response curves for standard filters.

let's use cutoff frequency, since it's fairly standard.

If a CW signal is being masked by one at a slightly higher audio frequency, you may be able to shift the interfering signal a bit higher and then use a bandpass filter to add further selectivity to the signal you are copying. If the cutoff frequency of your filter is fixed, this type of adjustment may be difficult. Many less expensive filters have a fixed cutoff frequency, while some of the more expensive ones, such as the M and M Electronics MSB-1, use ganged potentiometers so that the center frequency can be varied. Ganged pots get to be expensive, so designs are generally limited to two pots operated by the same knob. Since ganged potentiometers don't always track one another perfectly, filter performance is affected.

The Bencher XZ-2 bandpass filter has a variable cutoff frequency, but ganged pots are not used. A single potentiometer controls several transistors that act as variable resistors in the individual filter stages. This allows the center frequency to be changed rather easily, and it seems to be a reasonable solution to the mechanical problems of ganged potentiometers.

CW Regenerators

A CW regenerator is a fairly simple circuit in which a phase-locked loop (PLL) or other tone-detecting circuit is used to pick out a narrow frequency band.[6] Since the *output* of the PLL is a logic signal indicating tone or no tone, the CW signal being received is tuned so that the PLL "follows" it. An LED on the output provides a visual signal that can be used to show you when the PLL is accurately tracking the CW signal you are hearing. The output of the PLL is used to trigger an oscillator, and this tone is heard in a headset or on a speaker.

The net effect is to "reconstruct" the signal by having a narrow tone bandwidth detected and using this to generate a perfect tone for the listener. A CW regenerating unit called the Amcoder was available from AMC Engineering a few years ago, and a block diagram of this unit is shown in Fig. 3. Since PLL circuits are sensitive to the amplitude of the input signal, an agc stage between the receiver audio output and the PLL input is recommended.

Another CW regeneration circuit was described in *QST*.[7] This makes use of an "envelope detector" that demodulates the CW tones and triggers an oscillator to regenerate a perfect tone. This circuit also incorporates a delay so that noise spikes do not trigger the tone oscillator.

Many other types of filters—LC, RC, acoustic, etc.—have been described by amateurs and professionals.[8]

Switched-Capacitor Filters

During the last year or so, a new type of filter integrated circuit has come on the market. This is called the *switched-capacitor filter*, or SCF, and several types are available. Among the easiest to use is the National Semiconductor MF-10 SCF.[9] It costs about $3.00 and can be set up easily to perform any of the four filter operations. No external capacitors are needed, and only a few external resistors are used. There are two filter circuits in each MF-10 integrated circuit. Without going into the theory of operation, I'll just tell you that the cutoff frequency of the MF-10 filter chip is set by using an external clock. The clock frequency is selected to be either 100 or 50 times that of the cutoff frequency of the filter you are designing. The 100/50 ratio is preset at one pin on the MF-10 chip. Since this is just a logic-state input, it provides an easy way to change the range of the filter. Either a CMOS- or a TTL-compatible clock signal may be used.

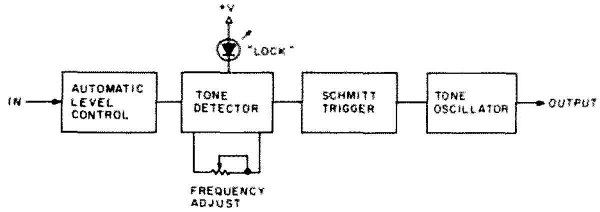

Fig. 3. Block diagram of a CW regenerator.

If you want to use the MF-10, you can set it up for a particular type of filter and vary the cutoff frequency of the filter by varying the clock frequency. One problem with all SCF circuits is that a small amount of clock signal is superimposed on the audio signal being filtered. However, since the clock frequency is so much higher than the audio signal, one, you won't be able to hear it, and two, it's easy to put a simple RC low-pass filter in the final audio output circuit to remove most of it. A typical fourth-order, 1-kHz low-pass filter is shown in Fig. 4.

In this circuit, both filter circuits in the SCF chip (each of which is a second-order filter) have been used in series. Using a common clock frequency for all of the filter stages lets you easily change the center frequency of the filters, and they all track one another without significant errors. Additional information about the MF-10 is found in the 12-page data sheet for this device.

Two other SCF devices are the Motorola MC145414 dual tunable low-pass filter and the MC145433 notch filter.[10,11] These devices were designed for use primarily in data communications equipment and modems, but they can be adapted for amateur use. They are a bit expensive, in the $10 to $20 range.

The Reticon R5620

I have found that the most interesting SCF is the R5620, manufactured by EG & G Reticon and available for about $7.50. This filter has built-in high-pass, bandpass, notch, and low-pass operations, and no external filter components are needed. All of the filtering is done on the chip with built-in circuitry. The EG & G Reticon Company manufactures linear photodetector arrays

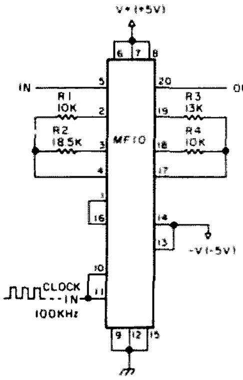

Fig 4. Using an MF-10 filter chip for a 1000-Hz, fourth-order, low-pass filter.

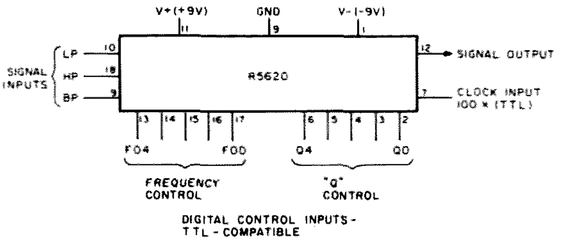

Fig 5. Pin configuration of the Reticon R5620 SCF chip.

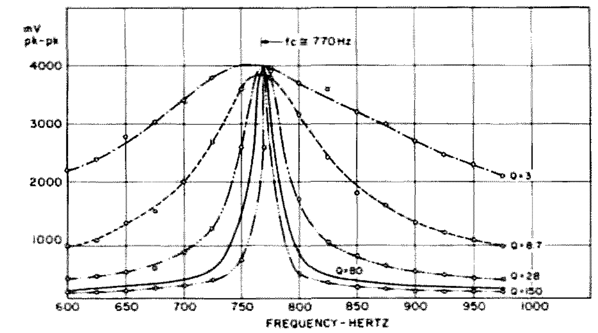

Fig. 6. Response curves for the Reticon R5620 used as a bandpass filter.

and x-y photodetector arrays that are used in solid-state TV cameras. They also produce very complex and expensive filter devices for special signal-processing applications.

In a filter circuit that uses the R5620, the cutoff frequency and its Q are independently set by providing five binary (logic 1, logic 0) inputs for each function. This means that there are 32 independent settings for each one. Any one of the four filter actions can be selected. Except for a few resistors on signal inputs, no other external components are required. A pin configuration diagram of this chip is shown in Fig. 5. This chip uses a split +9-volt power supply and an external clock signal. The clock signal can be TTL-compatible, but it is also easy to build a clock circuit that will run from the +9-volt power supply.

The center frequency of the R5620 filter can be changed by changing the clock frequency or by changing a 5-bit binary code applied as logic levels to five pins on the R5620 chip. It is this set of digital inputs that gives the R5620 a great deal of flexibility. The five digital inputs are labled FO4–FO0 and they are shown in Table 1. The clock rate is listed as the ratio of the cutoff frequency to the clock frequency. The control inputs are simply provided as a 5-bit straight-binary code. Let's look at an example. We'll assume that a 100-kHz clock signal is used and that the ratio of 102.3 has been chosen by setting FO4–FO0 to 01111. The filter's cutoff frequency is 978 Hz.

If the 100-kHz clock signal is used, the filter's cutoff frequency can be varied from 500 Hz to 2 kHz by varying the 5-bit binary code on frequency-control lines FO0–FO4 between 00000 and 11111. The 32 frequency steps are logarithmic, which simply means that the frequency ratios are fairly even, about 4 to 5% per step.

The alternate approach is to preset the 5-bit frequency code for the R5620 at about its mid-frequency setting (10000) and then vary the frequency of the clock signal controlling the filter. Without careful clock-circuit design, this can present problems. Many home-brew clock circuits spread out the low frequencies on one side of the frequency-controlling potentiometer, but high frequencies are "scrunched" at the other side. Using a fixed clock frequency and changing the 5-bit control input seems the better method of frequency control.

The Q of the filter also can be varied by using the five digital inputs labeled Q4–Q0. As shown in Table 2, the Q can be varied from 0.57 to 150. That's right, 150! Of course, you're not going to get much useful information through a bandpass filter with this high a Q, but in between 150 and 0.57 there is a lot of useful filter power. Typical bandpass response curves are shown in Figure 6.

The R5620 has three signal inputs, LPin, HPin, and BPin, and by connecting the audio signal to be filtered to one of these, the appropri-

Frequency Binary Code FO4 . . . FO0	Clock Frequency / Cutoff Frequency	Cutoff Frequency for 100-kHz Clock
0 0 0 0 0	200.0	500 Hz
0 0 0 0 1	191.3	523
0 0 0 1 0	182.9	547
0 0 0 1 1	174.9	572
0 0 1 0 0	167.2	598
0 0 1 0 1	159.9	625
0 0 1 1 0	152.9	654
0 0 1 1 1	146.2	684
0 1 0 0 0	139.8	715
0 1 0 0 1	133.7	748
0 1 0 1 0	127.9	782
0 1 0 1 1	122.3	818
0 1 1 0 0	116.9	855
0 1 1 0 1	111.8	894
0 1 1 1 0	106.9	935
0 1 1 1 1	102.3	978
1 0 0 0 0	97.8	1022
1 0 0 0 1	93.5	1070
1 0 0 1 0	89.4	1118
1 0 0 1 1	85.5	1169
1 0 1 0 0	81.8	1222
1 0 1 0 1	78.2	1279
1 0 1 1 0	74.8	1337
1 0 1 1 1	71.5	1399
1 1 0 0 0	68.4	1462
1 1 0 0 1	65.4	1529
1 1 0 1 0	62.5	1600
1 1 0 1 1	59.8	1672
1 1 1 0 0	57.2	1748
1 1 1 0 1	54.8	1825
1 1 1 1 0	52.3	1912
1 1 1 1 1	50.0	2000 Hz

Table 1. Binary frequency-control codes. Frequencies are for a 100-kHz clock signal.

Q Binary Code Q4 . . . Q0	Q
0 0 0 0 0	0.57
0 0 0 0 1	0.65
0 0 0 1 0	0.71
0 0 0 1 1	0.79
0 0 1 0 0	0.87
0 0 1 0 1	0.95
0 0 1 1 0	1.05
0 0 1 1 1	1.20
0 1 0 0 0	1.35
0 1 0 0 1	1.65
0 1 0 1 0	1.95
0 1 0 1 1	2.20
0 1 1 0 0	2.50
0 1 1 0 1	3.00
0 1 1 1 0	3.50
0 1 1 1 1	4.25
1 0 0 0 0	5.00
1 0 0 0 1	5.80
1 0 0 1 0	7.20
1 0 0 1 1	8.70
1 0 1 0 0	10.0
1 0 1 0 1	11.5
1 0 1 1 0	13.0
1 0 1 1 1	15.0
1 1 0 0 0	17.5
1 1 0 0 1	19.0
1 1 0 1 0	23.0
1 1 0 1 1	28.0
1 1 1 0 0	35.0
1 1 1 0 1	40.0
1 1 1 1 0	80.0
1 1 1 1 1	150

Table 2. Binary Q-control codes.

Filter Action	LPin	HPin	BPin
Low-pass	Signal	GND	GND
High-pass	GND	Signal	GND
Bandpass	GND	GND	Signal
Notch	Signal	Signal	GND

Table 3. Signal input connections for different filter actions.

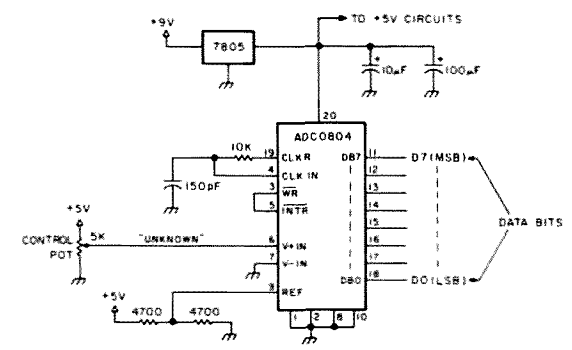

Fig. 7. Using an 8-bit ADC0804 A/D converter as a knob encoder.

ate filtering is done. When the notch filter is to be used, the audio signal is routed to both the LPin and the HPin inputs. The chart in Table 3 shows how the signals are connected. There are other combinations of these three inputs, but they are not useful for filtering.

Since the R5620 has a 0-dB insertion loss, no external signal amplification or attenuation is needed. However, if you want to use this filter between your receiver and headphones or a speaker, an audio output amplifier is recommended. There are many of these in integrated-circuit form, and they are easy to use.

The R5620 filter circuits can be cascaded, and you can control each one separately or you can use parallel digital inputs and control them simultaneously. The next question is how to get a 5-bit binary code.

Digital Filter Control

One of the obvious ways to generate the 5-bit code is by using a series of five on/off or logic 1/logic 0 switches. This may be fine for testing, but for on-the-air use, it's impractical. Thumbwheel or rotary switches provide an alternate, but most of these are limited to 12 or 16 positions. There are lots of 40-position binary-coded rotary switches available from old 40-channel CB units, but these use an odd type of binary code, so they can't be used easily to generate the required 5-bit straight-binary code.

A solution that isn't as obvious is to use an analog-to-digital (A/D) converter to generate the binary codes that are needed. An A/D converter has a minimum and a maximum voltage range, and when an "unknown" voltage is within the range, the converter will provide you with a binary code that represents the unknown voltage. Thus, for an 8-bit converter, the range of measurable voltages might be between 0 and 5 volts, with the binary outputs being 00000000 up to 11111111. Computers and other digital devices use A/D converters to measure unknown voltages.

The National Semiconductor ADC0804 8-bit A/D converter was chosen because it is easy to use, readily available, and inexpensive. It is used in a free-running mode, so that conversions are done one right after the other. A potentiometer is used to provide the voltage input, and the A/D converter provides an 8-bit straight-binary output, as shown in Fig. 7.

This circuit provides an 8-bit output that goes from 00000000 up to 11111111, from one side of the pot to the other. The function is the same as that of a 256-position binary-coded rotary switch. Not bad for about $4.00. Since only five bits are needed, the most-significant five bits, D7–D3, are used. The other three bits, D2–D0, are not used. This arrangement provides for 32 binary codes, linearly spaced across the range of the potentiometer. The ADC0804 chip has a fairly low input impedance, so a low-value potentiometer must be used to provide the unknown voltage that is to be converted into a binary code.

A rotary switch with four positions and three poles is used to route the input audio signal to the correct inputs for the four filter actions. This is shown in Fig. 8.

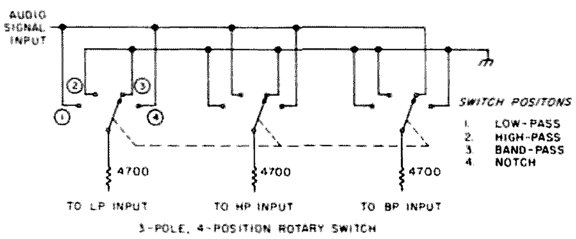

Fig. 8. Schematic diagram of the filter control switch.

A complete filter circuit is shown in Fig. 9. You can cascade as many of these stages as you want to and put them together in various combinations. For example, you might have two filters in series. Both could be set up for low-pass operation, providing a fourth-order low-pass filter. Or you could set one for low-pass operation and the other for notch operation. Of course, the audio output amplifier is only needed at the end of the filter chain.

Using the Filter

There are many uses for a

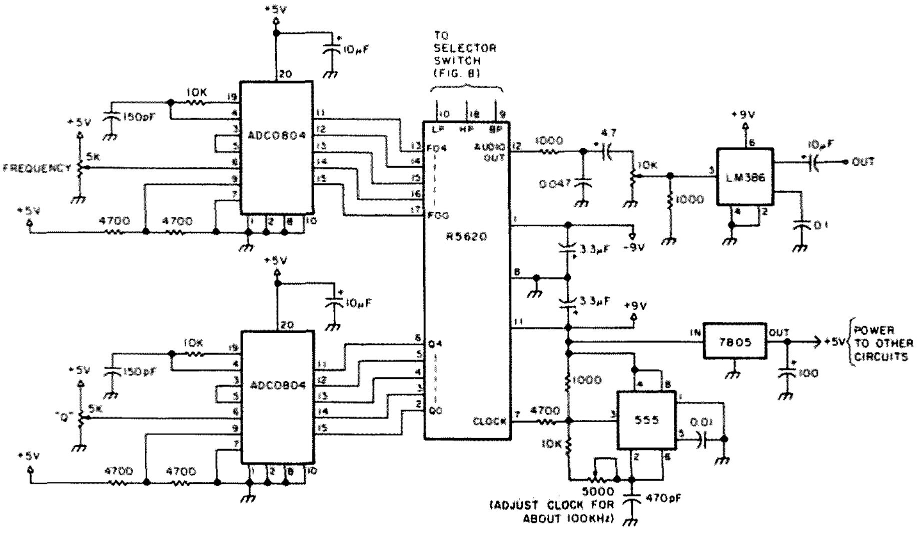

Fig. 9. Schematic diagram of the complete filter circuit.

Addresses of SCF Manufacturers

National Semiconductor Corporation
2900 Semiconductor Drive
Santa Clara CA 95051

Motorola Semiconductor
3501 Ed Bluestein Blvd.
Austin TX 78721

EG & G Reticon
345 Potrero Avenue
Sunnyvale CA 94086

The R5620 and other interesting devices are available from:
Applied Invention
Rte. 21, Box 390
Hillsdale NY 12529

versatile filter, particularly since all of the basic filter operations are available on one chip. Since the cutoff frequency and the Q can be varied, this type of filter is useful for SSB, CW, and RTTY operations.

For example, if you are using a Bell-202-compatible modem, you'll be using tones of 1200 and 2200 Hz. You can build a switched-capacitor filter for each frequency, deriving the clock signal from one common crystal. The frequency would be 1200 × 2200, or 2.640 MHz. Since the filter's clock frequency must be 100 times the center frequency of the signal being filtered, dividing the 2.640-MHz clock by 22 and by 12 gives the proper clock signals for the two filters: 120 kHz and 220 kHz, respectively.

In this application, bandpass filters would be used and the cutoff frequency controls would be preset. The Q of both filters could be set in parallel by a single control or each could be set separately.

A filter-and-monostable RTTY demodulator is described in the 1982 edition of *The Radio Amateur's Handbook*,[12] and several SCF circuits could be used in place of the op-amp-based active filters. Using SCF circuits allows the filter characteristics and frequencies to be easily changed.

Switched-capacitor filters provide an alternative to op-amp-based filters in many ham-radio applications. They are not much more expensive than the classic circuits, particularly when you consider their flexibility and the ease of designing circuits around them. I think you'll see more amateurs using SCF chips and coming up with new applications for them. ■

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Your Own Optoelectronic Anemometer

Light control and car-top calibration make this project cheap to build, easy to align, and extraordinarily accurate.

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In my January, 1983, *73* article, the question was, "Can you really see which way the wind is blowing with optoelectronics?" Now, I ask, can you really see *how fast* the wind is blowing?

The answer to both questions is, of course, yes. We will use the GE H13A1/H21A1 interrupter module to tell us wind velocity—how fast the wind is blowing.

Perhaps I should reiterate at this time that the GE number for the H13A1 interrupter module has been changed from H13A1 to H21A1. The modules are interchangeable. So from here on, I will refer to it as the H21A1.

General Circuit Description

This circuit uses very few electronic components. A good portion of the work involved in building the anemometer head is the mechanical end of it. But more about that later. The electronic components consist of an H21A1 and a 2N3904 transistor line driver up in the head of the anemometer. Down in the shack there is an LED that blinks when the wind is blowing (I am not quite sure why I put that in there—I guess I just like whistles, lights, and bells). There are twelve in-

Photo A. Anemometer head with weather cover removed.

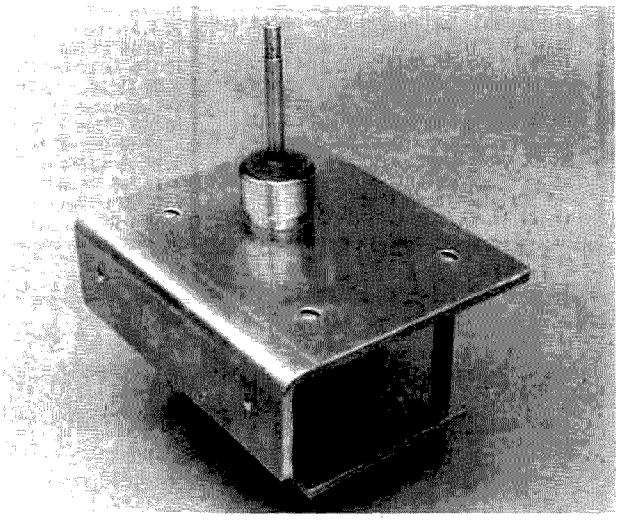

Photo B. Anemometer head with cups removed showing top bearing seal and side mounting surface.

Mph	mA	Pps	Rpm
5	.17	7.2	54
10	.33	14.3	107
15	.50	21.5	161
20	.67	28.7	215
25	.83	35.8	269
30	1.0	43.0	322
	High Scale		
15	.17	21.5	161
30	.33	43.0	322
45	.50	64.5	484
60	.67	86.0	645
75	.83	107.5	806
90	1.0	129.0	967

Table 1. Speed conversion chart.

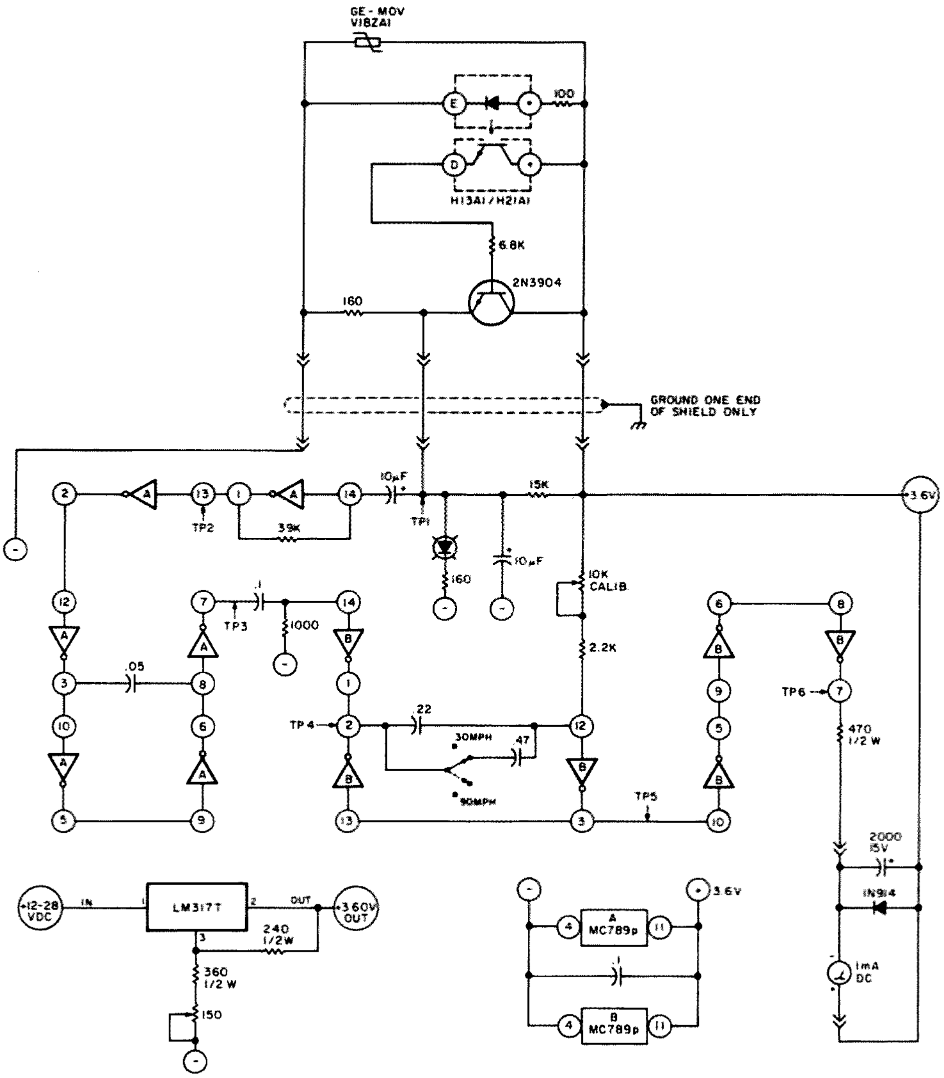

Fig. 1. Velocity meter circuit. All resistors ¼ W except as noted. All capacitors uF. Look on top of H13A1/H21A1 for correct pinout.

verter gates in the two DIP packages, a few resistors and capacitors, a 3.6-volt power supply, and a 1-milliamp meter. Perhaps I should mention at this time that the meter and your calibration are the only two things that would limit the accuracy of the electronic circuit. The electronics are extremely linear, so it is important that you use a good meter, one with which you can redo the scale as we did—it's not hard. More on that later, too.

The MC789P or ECG9989 RTL inverters are part of an old family of ICs, but they are still readily available at an inexpensive $3.00 price. The most important reason we like this circuit is that it works without a hitch.

The trend toward digital readouts is usually an improvement over the old analog meter, but there are always exceptions to the rule and, in my opinion, wind speed is one of them. Unless, of course, you need a digital number to be used in an automated calculation, the old analog readout is a more comprehensive representation of what the wind is doing.

About the Circuit

From the schematic and the test-point waveforms in Fig. 2, the theory of the circuit will become apparent. A three-wire shielded cable is required to connect the anemometer head, up on the tower, to the readout in the shack. From there on it's just ones and zeros. Well, almost. The first entire IC package (6 gates) is used for shaping and compensating the input pulses. The second chip uses an RC network to generate a low for the exact period of time it takes to make the meter read correctly.

Switching-in the .47 μF capacitor affords you a full scale of 30 mph (a good scale for normal operation); during a storm, flipping the switch will give you 90 mph full scale. The 2000-μF capacitor across the output tailors the meter to a nice,

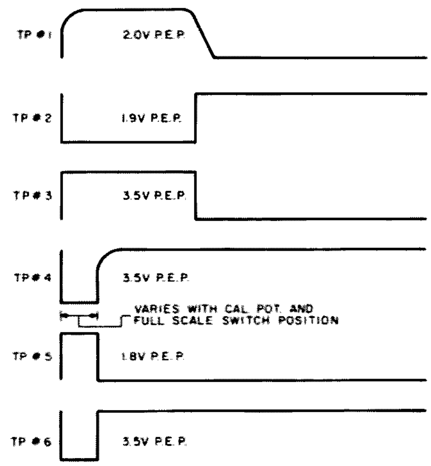

Fig. 2. Pulse trace. Waveforms taken with 43 Hz in, 2-ms sweep.

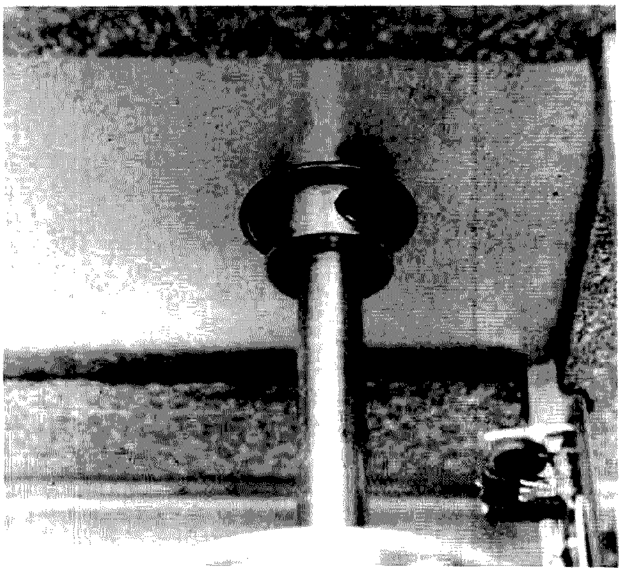

Photo C. A view of the bottom of the top bearing and the gasket that will seal the weather cover.

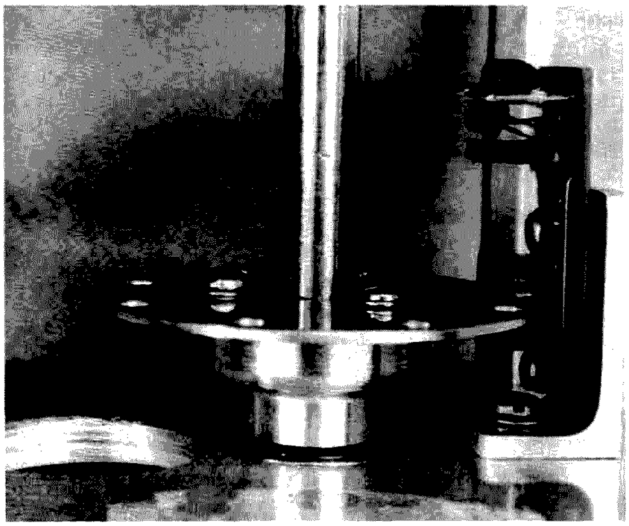

Photo D. The disk interrupter with its 8 holes running through the H211 interrupter module.

smooth, responsive movement. The 3.6-volt power supply is a snap; we used one of the adjustable three-terminal regulators from Radio Shack (number LM317T). The 150-Ohm pot allows ease of adjusting the output to 3.6 volts.

The data in Table 1 concerning mph, mA, pps, and rpm is supplied for reference only. Your anemometer may not perform exactly as mine did, but this data will give you a starting point.

If you have a signal or function generator with a 1.5- to 3-volt range and you can adjust its frequency from 7 Hz to 130 Hz with reasonable accuracy, you should be able to duplicate these readings by substituting your generator for the input from the anemometer head. I have gone one step further and used the generator to drive the H21A1 emitter directly by removing the 100-Ohm dropping resistor from the 3.6-V positive bus and connecting the generator to the free end of the resistor and to the negative bus. Of course, in this case, the anemometer head will remain connected to the readout board.

As seen in the photos, the electronics in the head and at the readout are mounted on PC board, Radio Shack #276-170. But I cannot recommend this board. For my purposes, the board worked out fine mechanically. However, when I wanted to solder to it, solder would not flow as I thought it should (even after cleaning), so additional flux was used resulting in nice wet-looking joints but a lot of flux residue. The board was tested and worked fine. By the way, the circuit was debugged and tested on a push-on breadboard before assembly on the Radio Shack board.

The board was then washed in a commercially available flux remover, and that's when my trouble started. After a few hours of "What the h— happened to this thing?" and "I can't believe what the scope is saying," I finally found I had contamination bridges all over the board. I had never used fiber PC board before and never will again. I had used the flux and flux remover together lots of times with no trace of trouble, but always on glass board. I finally washed the whole thing in detergent and water after trying some other solvents to no avail.

After drying and retesting, I gave the solder side of the board a coat of clear Krylon™. It has been doing fine ever since. The moral to the story is to use a good glass epoxy board.

There is only one other electronic component that bears mentioning, that being the GE MOV #V18ZA1 metal oxide varistor, located in the anemometer head. It plays no part in making the circuit work; its job is to limit the voltage on the 3.6-V bus during a lightning strike or other power-line spike. They have proven to me to be very effective in their job of over-voltage spike protection. If these units are sized correctly for the job, they will conduct during a spike and then restore to normal, over and over again. For their low price they sure can save you a bundle of trouble. So a word to the wise is sufficient: If you are not familiar with the MOV line, you may needlessly be jeopardizing some of those priceless gems in your shack.

The Mechanics

The model pictured in Photo A has 4″ cups. They are bigger than they would have to be for just a wind-velocity meter. These cups were fabricated from 4″ aluminum funnels. I cut the snouts off the ends of the funnels and bent very thin aluminum sheet metal into the shape of a cone to close the holes. Then I secured it to the funnels with aluminum pop rivets. I would suggest using aluminum soup ladles, approximately the two-inch size, for your cups. The rods are ¼″ aluminum, threaded on one end to secure the cups, and they're approximately 2.25 times the diameter of the cups in length. The hub that mounts the rod to the shaft was machined from a solid piece of aluminum round stock 2″ × ¾″ thick. Holes were drilled and tapped for set screws to secure the rods and shaft. If soup ladles were used I am sure some bolting or clamping arrangement could be devised to secure the ladle handles to the shaft. This would eliminate the need for a machined hub, if the machine work is a problem. I would also recommend using a ⅜″ shaft instead of a ¼″ shaft.

Photo B is a view of the anemometer with the cup assembly removed to get a better look at the top bearing seal and the side mounting surface. The top bearing seal is exactly as described in the previous article ex-

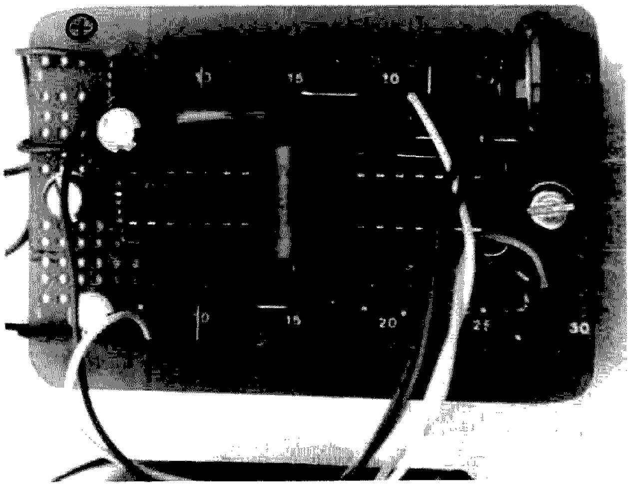

Photo E. The circuit board that drives the readout meter. Note test points.

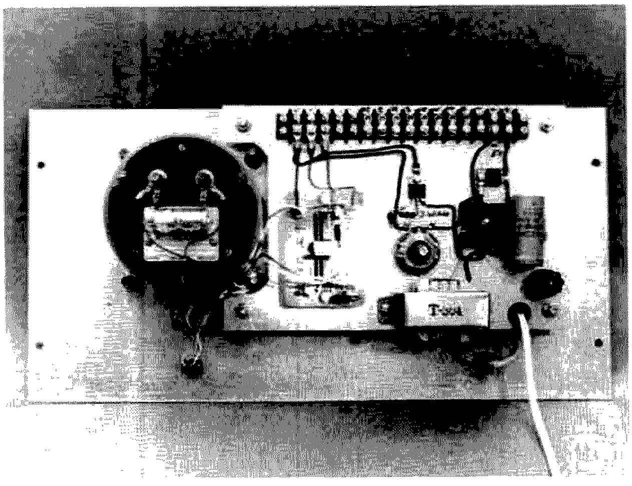

Photo F. Rear of readout panel.

cept it is epoxied to the shaft instead of clamped with a set screw. The mounting surface would depend on what you are going to mount it on. We mounted the wind-velocity and directions heads on a piece of 2" × 2" box aluminum approximately 5' long and bolted it to the tower. There will be some wind load so whatever you mount it on must be good and stiff.

Photo C is a view looking up under the top plate to show that the bearings in this unit were pressed into the ¼" top plate and bottom plate rather than using bearing blocks as described for the wind-direction model. I prefer the bearing block method because of ease of precision alignment. Also shown in Photo C is the cork gasket used for sealing the five-sided weather cover.

Photo D is a look at the disc interrupter running through the H21A1 with its associated electronic components such as the 2N3904 line driver, the V18ZA1 MOV, etc. The disk interrupter is nothing more than a 2½"-round by ⅛"-thick aluminum disc with eight evenly spaced ¼" holes in it. It is secured to the shaft by a machined collar. It also serves as the bottom shaft stop, which rides on top of the bottom bearing. Collars such as those pictured in Photo C can be purchased for approximately $1.00 at any machinery house, and the interrupter disc could be epoxied to it instead of a machined collar.

The PC board is mounted on a piece of aluminum angle with insulating standoff washers (such as are used in mounting transistors to heat sinks). The hole in the bottom plate that the angle mounting screw goes through is oversized to facilitate alignment. The same method used in the wind-direction indicator for getting wires off the board and down to the shack is used here. There are two male pins near the top of the board and one female pin covered with shrink tubing below. Another method would be to run the three wires of the board to a barrier strip as pictured in Photo F, but with only three lugs of course.

Photo E is the electronics board at the readout. Layout of this board is not critical. (Where have I heard that before?) The vertical trimpot at the right-hand corner is the calibration pot. It's the only electronic adjustment in the whole circuit except for the power-supply voltage.

Photo F is a view of the back of the readout panel. This panel as seen in Photo G is used for wind direction and velocity with some spare room for future generator control. On the left is the velocity meter with the 2000-µF capacitor across its terminals. Under the meter are the range switch and blinking LED. On top is the barrier strip on which all the wires terminate that go to the two heads up on the tower. Next are the electronics board as pictured in Photo E, the 3.6-V regulator and adjusting pot, and the 5-V regulator for the wind direction electronics. Below are the rectifier bridge, filter capacitor, power transformer, line fuse, and on-off switch.

Photo G is of course a front view of the readout panel. Perhaps now is as good a time as any to talk about the meter scale. As I mentioned before, this scale was hand calibrated, reincremented, and numbered. For those of you who have never tried that sort of thing, let me tell you, it's not as hard as you might think. However, you must start with a one-milliamp meter that you can separate without destroying. We will get into calibration shortly.

Take the meter apart and very carefully remove the face. You will find the bigger and better meters are easier to work with. Then spray the face with a flat white spray can until all traces of the old markings are no longer visible except 0 and full scale. When dry, give it a coat or two of clear Krylon. Now new increments and numbers can be put back on with comparative ease. Use a fine felt-tip black indelible pen, such as used to mark clothing, for the increments. They must all point to the pointer shaft. The meter in Photo G has a 4" face and I used ¼" vinyl stick-on numbers. You can also use roll-on numbers but in my opinion, they are harder to work with. The pen and the numbers can be purchased at any stationery store.

Calibration

I am sorry to say I have no sure-fire method for you to follow. But I can tell you how I set mine, and it duplicates the reading of a commercial unit not far away. After looking high and low for a calibrated wind tunnel with an aperture big enough to get this thing in, I finally gave up and decided I must come up with some other method. The only way I could think of to calibrate

the meter was with my Jeep. It has a roof carrier on top so it would be no problem to mount the anemometer head on it and just calibrate my new gadget by driving down the road using the speedometer for my reference.

But how accurate is the speedometer? After beating the bush a little more, we found an automotive shop that was set up to certify auto speedometers for police departments, and after telling the fellow what I wanted, he agreed to test my speedometer for a nominal fee. He would make no corrections but would give me a graph showing what my speedometer indicated and what the true speed was. Well, that sounded good to me. It turned out that my speedometer was flat up to 70 mph. I am told it is not unusual for an auto speedometer to be a fairly accurate device if the car has the original size tires and they are not worn too badly.

I got everything ready, brought a few pieces of wood to help mount the head to the roof carrier, and installed the weather seal cover, etc. As soon as a nice zero wind day came along, we would be ready to go. The day finally came, with my son Mike at the wheel and me in the back seat with all the goodies: a counter, DVM, the readout panel, and a 12-volt battery which, by the way, is how we powered the input of the 3.6-volt regulator during our mobile test. After hitting the open road, calibration went very well. I had already established, with the function generator described before, that the electronics were sound. But we had some apprehension about the cups being nonlinear at the very low end and the very high end. But even with the over-sized cups used in this model, linearity did not display itself as a problem. The calibration pot was set at exactly 30 miles per hour to indicate 1 milliamp on the meter (with the range switch set to the zero- to thirty-miles-per-hour position). At this speed, the counter indicated 43.0 pulses per second. With a few more tests and a little help from the calculator, we calculated how many pps we should get every five miles an hour from 5 mph to as fast as we could go.

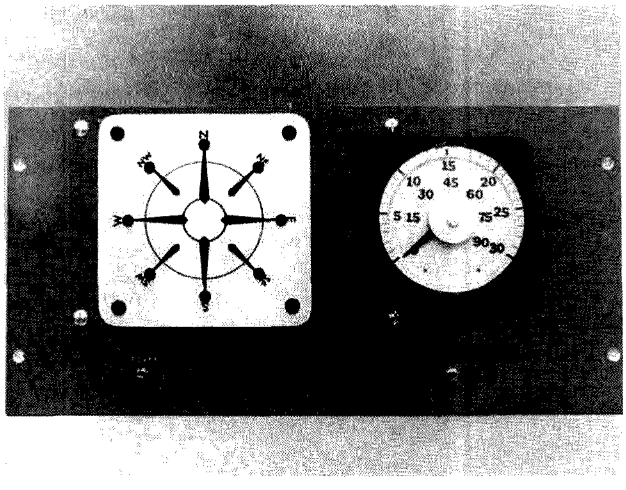

Photo G. Face of readout panel.

Surprisingly, everything held out very well. However, we still had some doubts about the top end of the 0-90-mph range, so I said to Mike, "Let's make one more high-speed run and then head for home." Well, let me tell you everything was looking good. We came up through 30 mph, 45 mph, and 60 mph, and I was thinking to myself that if we could only hold 75 mph for a few miles I would be satisfied that we had made a valid test. I heard Mike say "uh oh," simultaneous with what I recognized immediately as the wail of an electronic arm-of-the-law-type siren.

I think the cups on top were still turning as that big dude walked over to the Jeep. He did not want to believe that thing on top was not some new device designed to foul up his radar. Nor did he stop writing when I mentioned that maybe Wayne Green would hear about this. So, like I said before, I wish I could tell you a better way to calibrate this thing.

The test data in Table 1 was obtained from the aforementioned test, so it was possible now to go back to the bench and use the function generator to reincrement the meter.

If you don't have a generator, you can mark the face of the meter at the 5-, 10-, 15-, 20-, 25-, and 30-mph points with a pencil while you are doing your calibration run and then ink them in later.

After reincrementing and numbering the face, it was given an additional coat of clear Krylon, reassembled, and retested. The whole system has worked fine ever since.

May I take this opportunity to thank my wife, Ann, for her help and support while getting this article together. And, of course, my son Mike who got the ticket. ■

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Rampant RTTY

Create the ultimate mailbox! K0WVN describes a system that operates from 45 to 1200 baud with dual shifts—automatically!

A ROM-116 RTTY mailbox system is a good tool for local amateurs to keep in touch with each other on VHF and UHF frequencies. It can also be used in disaster-type operations as temporary storage for messages.

I witnessed a great need for this sort of system when I happened to be listening to a bunch of VHF phone traffic after a small tornado hit a portion of Topeka. There was so much delay caused by hand copying and repeating of information that I felt sorry for the operators. A RTTY mailbox system would have been the answer to their communication problem; just a plain RTTY system with a printer would have done the trick.

Later, after the operation was completed, the local club did invest in RTTY communications for both the mobile unit and the base station. I am sure that the system will speed up this sort of traffic handling and improve accuracy. When the traffic is coming in from all directions, it is nice for a RTTY system to remember what was said and be able to print it out when you want it.

Flesher Corporation is now the sole distributor of the ROM-116 and is now responsible for its future. This interface has proven to be one of the most dependable systems ever made to interface with the Radio Shack TRS-80 (Models I, III, and 4). The author of the ROM-116 software, Craig Larsen WA7HTN, and his partner, Gary Martin W7XT, spent a great deal of time creating a system that would satisfy even the most picky operator (such as myself).

Crown Microproducts (located in Marysville WA) was made up of these two dedicated hams, and between the two of them, they created their primary product, the ROM-116. I know that Craig had spent a great deal of time on the standard operating software and was in no mood to tackle another project. His time spent creating the software probably did not return him fifty cents an hour, which sours many a programmer from creating hobby software to begin with.

After so many hours of Craig's time in writing the standard RTTY/CW software, it was a struggle for the ROM-116 users to talk him into writing another

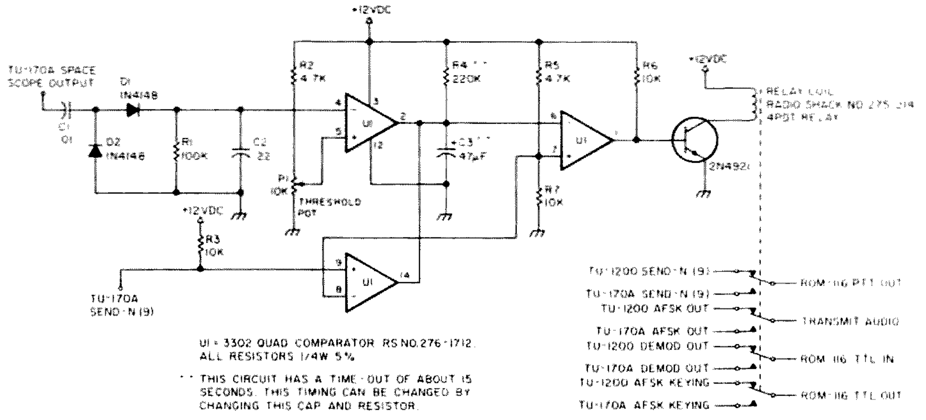

Fig. 1. The circuit and the relay connections. Caution: Do not use the TU-1200's 12-V-dc power supply to supply the circuit or the relay. The TU-1200 will not handle any supply drain outside of the unit.

software creation. It takes time, patience, total concentration, and determination. You can imagine; both of these fellas already had a full-time job, and total concentration can be hard to achieve in a family atmosphere.

After several prototype mailbox programs, Craig finally settled on version 1.4.2 MBO for the Model I and 3.4.2 MBO for Models III and 4. I will briefly touch on a couple of features that the ROM-116 has to offer, at least the ones we will be working with on the additional circuitry.

The ROM-116 mailbox-system communications-rate feature is like none other I have seen. It has ability to receive a remote command over the airways to change the baud rate from 45.5 to 1200 baud. This is one of the few (if not the only) systems that has the ability to run at this fast of a baud rate and still maintain a split-screen format. The control operator has to initialize a baud rate agreeable to everyone on the system, and this initialized baud rate will set a default. If a mailbox user accidentally sets a speed that he is unable to communicate with, the system will delay and default back to the speed set by the control operator. This is only one of many fine features the system has to offer, and it would take another article just to explain the remaining features of the ROM-116 mailbox software.

I had a problem with the hams in this area when I tried a system that had to have an "open command" before you could ask the system for your mail (which was another command on top of that). After you started the mailbox system sending your mail, you had to remain in the shack to give it an "exit command." The users of this mailbox system started dying off, discouraged with the procedure required in order to get the mail. Most of the users wanted a system that would allow them to go into the shack, give a read command for their mailbox, and walk off—having the messages print out without having to wait to close the mailbox.

The ROM-116 mailbox software was the answer to this problem, and everyone was happy with the elimination of a lot of "Howdy," "Exit," and all that sort of chit-chat from the computer on the other end. This is called user friendly according to some, but our group calls it time-consuming nonsense. For some reason, there is a large number of operators that like mailbox software programs that talk a lot to the users of the system. Our group here could care less about chatting to the computer; it seems to insult their intelligence.

It is not the purpose of the system to carry on a conversation with a computer controlling the mailbox system.

Our system was very simple—nothing fancy or expensive to maintain. The rig consisted of an old 1950s-vintage General Electric VHF transceiver that had a Flesher Corporation HF-144 on the receiver to give us about a 30-dB gain for those weak signals. It could transmit 50 Watts all day long. This rig had held my house down during high winds for many years, and it took the better part of our backs to remove it from my shack. After we healed from the hauling of the transceiver, we acquired a Radio Shack TRS-80 Model I with 48K of memory (and one disk drive from Andy Anderson KØNL). A single-density disk will not hold very much data for a mailbox system, so I purchased a double-density controller board and installed it into the expansion interface of the TRS-80. I had three ROM-116 interfaces (for some unknown reason) and I donated one for this interesting project, along with the antenna. Jerry Flesher KØTNC donated the location and a TU-170A. It was all interfaced together, and the final tuning was done by Gene Godsey KØBXJ.

Well, everything seemed to be running smoothly. The ROM-116 and the Flesher TU-170A ran flawlessly for over a year. Then, Flesher Corporation came out with the TU-1200 terminal unit, capable of running at any rate from 45.5 to 1200 baud. Here is a terminal unit that would do both Baudot and ASCII and could be run at the full output rate of the ROM-116 system. Up until this point, we had been limited to the 300-baud maximum of the TU-170A.

The TU-1200 is a 1000-Hz-shift terminal unit using 1200-Hz and 2200-Hz tones (Bell 202 compatible). The TU-170A had been running 170-Hz-shift (2125-Hz and 2295-Hz) tones.

Okay, we could now get our speed up, but there was one minor problem of what to do about the people still wanting to use the 170-Hz shift. I wanted to have both on the same system. It was hardly worth two identical systems just for faster baud rates.

So, the problem was to find a way of using both the TU-170A and the TU-1200 on the same system without sacrificing anything we already had. After trying several circuits, a workable solution to the problem was found. By detecting the space signal (2295 Hz) from the scope output of the TU-170A, we were able to make the system work perfectly normally for either terminal unit.

As shown in Fig. 1, the space scope output of the TU-170A is fed into the circuit through C1 and D1 to pin 4 on U1. A threshold pot (P1) is used to set the sensitivity of the input. Time-out delay is set with the combination of R4 and C3, and with the values shown, the delay will be about 15 seconds. When a space signal is detected from the TU-170A, U1 will trigger Q1 and then pull in the relay, connecting all the necessary I/O to the TU-170A. When the circuit remains inactive for the set time (determined by R4 and C3), the relay will then release and reconnect the I/O to the TU-1200. The TU-170A SEND-N (pin 9) connects to the circuit board at pin 9 of U1 and also connects to one of the relay contacts (normally open) of the relay. When the 170-Hz shift is detected and the relay is pulled in, the PTT of the ROM-116 will keep the input at U1 pin 6 constant and prevent the circuit timer from timing out and dropping the relay during transmission.

A 12-V-dc DPDT relay with 5-Amp contacts is installed inside the ROM-116 and is used to make contact with external PTT requirements. The relay will key a common to the TUs and to the transmitter PTT input. This was a must on our setup since the PTT relay inside of the transmitter is powered with about 30 volts ac, and solid-state devices do not mix with ac too well. Some VHF and UHF rigs may pull a lot of current on the PTT inputs; the relay would be the answer to this situation, too.

Adjusting the threshold potentiometer (P1) of the detector circuit can be done by connecting a 2200-Hz tone oscillator to the audio input of the TU-170A and adjusting P1 so that the 2200-Hz tone will not activate the relay. Touching up on this adjustment may be required in actual operation at a later time. Power for the circuit and the relay can be obtained from the TU-170A's power supply. I built the circuit up on a piece of hobby perfboard which can be bought at Radio Shack (along with most of the other components).

The TU-1200 is not just for the group that has 1200-

baud capability, it is for anyone that wants to use the system from 45.5 baud to 1200 baud. If anyone wishes to access the mailbox system with a 170-Hz terminal unit, it is no problem at all. Using 1200 baud sounds like a buzz saw to those not familiar with the sound, and it is impossible to read as it is being displayed on the screen. I can now get a long picture or bulletin from the system, save it to memory, and print it out later, or save it to disk. What used to take forever (receiving text at 60 wpm (45.5 baud)), now takes only a matter of seconds.

This circuit seems to be very quick when switching, so nothing seems to be cut out. The ROM-116 RTTY operating software has a diddle feature that can be set to however many diddles you desire. I set mine for 10 diddles, and this seems to do fine for even the 1200-baud operation. There is a delay due to the PTT circuit in both the mailbox system and my system. So, by the time my transmitter drops out and is ready to receive, I may have missed part of a word. However, I do not see that this is a big problem. A change can be made to allow for the delay in the mechanical relays in the software.

We all got the word about the FCC not requiring CW identification every ten minutes while on RTTY. Now all we have to do is give identification in RTTY. Well, the following will tell you what to change in order to do this with your ROM-116 mailbox system.

The TRS-80 Models III and 4 can use the patch utility to make the following changes. The Model I will have to use a utility such as NEWDOS's SUPERZAP. The changes are as follows:

Model I, Ver 1.4.2 MBO
Address: 6D61H
Find: D5 3A A0 83 21
Change to: D5 C3 88 6D 21

Models III and 4, Ver 3.4.2. MBO
Address: 6DA9H
Find: 3A F5 83
Change to: C3 CF 6D

The exact patch format is: PATCH MBORTTY/CMD:0 (ADD=6DA9,FIND=3AF583,CHG=C3CF6D)

While this fixes the program so it will not send the CW identification, it also eliminates the only ID it has. So, the following patches will identify in RTTY whatever you have stored in buffer 6, such as "DE KØWVN MAILBOX SYSTEM TOPEKA." Here are the necessary patches:

Model I, Ver 1.4.2 MBO
Address: 57DBH
Find: 0A 00 C9 D7 0A 0A
Change to: 0A 00 C9 D7 0A B6

Models III and 4, Ver 3.4.2. MBO
Address: 57A4H
Find: C9 D7 0A 0A 00
Change to: C9 D7 0A B6 00

The exact patch format is: PATCH MBORTTY/CMD:0 (ADD=57A7,FIND=0A,CHG=B6)

Model I, 1.4.2 MBO: Addresses 57CF, 635D, 6379, 63B4, 63ED, 6418, 6454, 64AA, and 64F4; Find 4E; Change to B6.

Models III and 4, 3.4.2 MBO: Addresses 5799, 63A4, 63C0, 63FB, 6434, 645F, 649B, 64F1, and 653B; Find 4E; Change to B6.

After these changes are made, whatever you decide to enter into buffer 6 to be printed as an identification, be sure to add a carriage return before entering anything else in the buffer.

This should give you a super sytem, one that will operate trouble-free for a long time to come. Those of you using a different terminal unit can probably interface it in the same manner as the TU-170A with the TU-1200. In any case, I hope you have fun using the system and the faster baud rates. ■

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Decode Soviet Space Messages

As you read this, mysterious signals are being beamed into your shack. What do they mean? Where are they coming from? Use WDØBCI's satellite-telemetry reading program to uncover the facts.

You hear it on the high end of 10 meters whenever the RS satellites pass over: *RS5 KOO DOO OOO GOO UOO WOO*—the heartbeat of the satellite, the telemetry beacon. It provides a constant stream of data about the health of the spacecraft, but what does it all mean? Is there a way to figure it out? Take heart, because I am about to describe what the telemetry means, the hard way to decode it, and a much simpler way to decode it using a computer (you do have a computer, don't you?).

The telemetry provided by the RS series of satellites contains a wealth of information about the operating parameters of the spacecraft. It will tell you everything from the power output of the transponder to the ambient temperature. This information gives you an overall view of the health of the system. It can also tell you such things as how much time the satellite is spending in sunlight, or the moment when the satellite passes into or out of Earth's shadow.

So why bother to take an interest in this data? For one thing, the telemetry tells you if the transponder is turned on. You can't make contacts through the bird if it's not listening. Also, you can tell when the satellite is on the decline and about to fail. Besides, it can become

Frame	Chan.	Parameter	Unit of measure	Decoding formula
( )/E	K	Output power of transponder	mW	$(N^2)/5$
	D	Voltage of power source	V	0.2N
	O	Load current	mA	20 (100 – N)
	G	Telemetry test	—	None
	U	Hermetically-sealed container pressure	—	None
	S	Temp. of stabilizing unit	°C	N
	W	Temp. of transmitter radiator	°C	N
I/S	K	Output power of transponder	mW	$(N^2)/5$
	D	Zero-setting of telemetry mV meter	—	N
	O	Output power of beacon	mW	$(N^2)/5$
	G	Repeater sensitivity control	dB	N
	U	S-meter for 1st service receiver	S	0.1 (N – 10)
	S	S-meter for robot receiver	S	0.1 (N – 10)
	W	S-meter for 2nd service receiver	S	0.1 (N – 10)
A/U	K	Output power of transponder	mW	$(N^2)/5$
	D	9-V voltage at transponder	V	0.1N
	O	7.5-V voltage at transponder	V	0.1N
	G	9-V voltage at 1st stabilizer	V	0.1N
	U	7.5-V voltage at 1st stabilizer	V	0.1N
	S	9-V voltage at 2nd stabilizer	V	0.1N
	W	7.5-V voltage at 2nd stabilizer	V	0.1N
M/W	K	Output power of transponder	mW	$(N^2)/5$
	D	Filling-out of robot log	QSO	N + 1
	O	Power of turned-on heaters	W	0.1N
	G	Power of robot transmitter	mW	20N
	U	Power of service-channel transmitter	mW	20N
	S	Sensitivity control for robot transmitter	dB	N
	W	Sensitivity control for service-channel transmitter	dB	N

Note: The first frame identifier indicates normal operation. The second frame identifier indicates that the satellite is being serviced.

Table 1. Formulas used to decode telemetry of RS-series satellites.

an interesting diversion from the ordinary operation through the satellite.

OK, so there's some interesting information there, but how do you get it from *K00 D00. . .?* Each character specifies a *channel* of telemetry. A channel is a single parameter such as the power output of the transponder. The telemetry channels are grouped into sets of seven which are known as *frames*. The frames are sent sequentially, and there are four possible frames in a full set of telemetry data. From one to four frames may be sent by the satellite, depending on how the ground-control stations have configured the satellite for the day's passes. Frame identifiers also change if the spacecraft is in service mode, when the satellite is being commanded by ground control, or if the transponder is switched off to give the bird a rest.

Now that you know how the telemetry is sent, how do you go about decoding it? There are two ways—manually and by computer. Manually decoding the telemetry has one advantage—it's cheap. If you want to decode it in this fashion, Table 1 provides you with the necessary formulas to do it yourself.

Decoding telemetry by hand is a relatively easy exercise, but it's kind of boring. Face it, you probably have better things to do than figure out values from equations. It's really kind of dry. Well, thanks to technology, you don't have to slave over those formulas. The computer revolution has set you free. If you have a programmable calculator, you can program the formulas into it and ease the pain somewhat. Of course, you still have to look at the tables to assign some meaning to the numbers you get from the formula. But if you have a computer, it can do the work for you and even label the results.

Listing 1 shows a program that accepts telemetry data and converts it to human-readable form. It is written in Basic for the IBM Personal Computer but can be readily converted to run on other machines by anyone who is familiar with Basic.

The program prompts you for the frame identifier of the telemetry data, and then for the numbers following the channel identifier. The computer will calculate the values for each of the telemetry channels and print the corresponding values, all nicely labeled, on the screen for your examination. This can be repeated for as many frames of telemetry as desired.

After studying the program, you might wonder why I didn't include any routines to provide hard copy of the results of the telemetry decoding. The simple fact is that on the IBM PC, these routines are not needed since there is a key on the machine that allows you to dump the contents of the display to the printer. If you are adapting this software to another system, it is a simple matter to write the necessary routines to provide hard copy, or to replace appropriate PRINT statements with LPRINT (or whatever your particular system requires).

Now that you can understand this data, what can you do with it? For starters, try graphing load current on a pass-by-pass basis for sev-

Listing 1. Program to analyze and display RS-series telemetry.

```
30 'RS satellite telemetry decoding program V 1.0 by Todd Enders WD0BCI
40 '
50 'This program decodes telemetry data for the soviet RS3 through RS8 series
60 ' of amateur satellites.
70 '
80 '
90 'clear screen and disolay header and prompt for frame id
100 '
110 '
120 KEY OFF
130 CLS:LOCATE 1,20:PRINT"RS 3-8 Satellite Telemetry Decoder"
140 LOCATE 3,5:INPUT"frame ( none, E, I, S, A, U, M, W) ":FR$
150 '
160 '
170 'oromot for telemetry channel data
180 '
190 '
200 LOCATE 5,10:PRINT"K:"
210 LOCATE 6,10:PRINT"D:"
220 LOCATE 7,10:PRINT"O:"
230 LOCATE 8,10:PRINT"G:"
240 LOCATE 9,10:PRINT"U:"
250 LOCATE 10,10:PRINT"S:"
260 LOCATE 11,10:PRINT"W:"
270 LOCATE 5,14:INPUT K:LOCATE 6,14:INPUT D:LOCATE 7,14:INPUT O
280 LOCATE 8,14:INPUT G:LOCATE 9,14:INPUT U:LOCATE 10,14:INPUT S
290 LOCATE 11,14:INPUT W
300 '
310 '
320 'determine which frame to calculate data for
330 '
340 '
350 IF FR$="" OR FR$="E" OR FR$="e" GOTO 450
360 IF FR$="i" OR FR$="I" OR FR$="S" OR FR$="s" GOTO 680
370 IF FR$="A" OR FR$="a" OR FR$="U" OR FR$="u" GOTO 910
380 IF FR$="M" OR FR$="m" OR FR$="W" OR FR$="w" GOTO 1160
390 GOTO 130
400 '
410 '
420 'calculate data for base frame/E frame parameters
430 '
440 '
450 EK=K^2/5:ED=.2*D:EO=20*(100-O):EG=G:EU=U:ES=S:EW=W
460 '
470 '
480 'disolay data for base frame/E frame
490 '
500 '
510 CLS:LOCATE 1,20:PRINT"Channel ( )/(E) telemetry parameters:"
520 LOCATE 5,10:PRINT"Output power of transponder:";:LOCATE 5,50:PRINT EK:" mW"
530 LOCATE 6,10:PRINT"Voltage of power source:":LOCATE 6,50:PRINT ED;" V"
540 LOCATE 7.10:PRINT"Load current:":LOCATE 7,50:PRINT EO:" mA"
550 LOCATE 8,10:PRINT"Telemetry test:":LOCATE 8,50:PRINT EG
560 LOCATE 9,10:PRINT"Hermetically sealeo container pressure:"
570 LOCATE 9,50:PRINT EU
580 LOCATE 10,10:PRINT"Temp. of stabilizing unit:":LOCATE 10,50:PRINT ES;" C"
590 LOCATE 11,50:PRINT EW;" C"
600 LOCATE 11,10:PRINT"Temp. of transmitter radiator:"
610 LOCATE 24,10:PRINT"press any key to continue";:A$=INKEY$:IF A$="" GOTO 610
620 GOTO 130
630 '
640 '
650 ' calculate data for I/S frame telemetry parameters
660 '
```

```
670 '
680 IK=K^2/5:ID=D:IO=O^2/5:IG=G:IU=.1*(U-10):IS=.1*(S-10):IW=.1*(W-10)
690 '
700 '
710 'display data for I/S frame telemetry
720 '
730 '
740 CLS:LOCATE 1,20:PRINT"Channel (I)/(S) telemetry parameters:"
750 LOCATE 5,10:PRINT"Output power of transponder:":LOCATE 5,50:PRINT IK;" mW"
760 LOCATE 6,10:PRINT"Zero setting of telemetry mV meter:":LOCATE 6,50:PRINT ID
770 LOCATE 7,10:PRINT"Output power of beacon:":LOCATE 7,50:PRINT IO;" mW"
780 LOCATE 8,10:PRINT"Repeater sensitivity control:":LOCATE 8,50:PRINT IG;" dB"
790 LOCATE 9,10:PRINT"S-meter for 1st service receiver:"
800 LOCATE 9,50:PRINT" S- ";IU
810 LOCATE 10,10:PRINT"S-meter for ROBOT receiver:":LOCATE 10,50:PRINT" S- ";IS
820 LOCATE 11,10:PRINT"S-meter for 2nd service receiver:"
830 LOCATE 11,50:PRINT" S- ";IW
840 LOCATE 24,10:PRINT"press any key to continue";:A$=INKEY$:IF A$="" GOTO 840
850 GOTO 130
870 '
880 ' calculate data for A/U frame telemetry parameters
890 '
900 '
910 AK=K^2/5:AD=.1*D:AO=O*.1:AG=.1*G:AU=.1*U:AS=.1*S:AW=.1*W
920 '
930 '
940 ' display data for A/U frame telemetry
950 '
960 '
970 CLS:LOCATE 1,20:PRINT"Channel (A)/(U) telemetry parameters:"
980 LOCATE 5,10:PRINT"Output power of transponder:":LOCATE 5,50:PRINT AK;" mW"
990 LOCATE 6,10:PRINT"9 V voltage at transponder:":LOCATE 6,50:PRINT AD;" V"
1000 LOCATE 7,10:PRINT"7.5 V voltage at transponder:":LOCATE 7,50:PRINT AO;" V"
1010 LOCATE 8,10:PRINT"9 V voltage at 1st stabilizer:":LOCATE 8,50:PRINT AG;" V"
1020 LOCATE 9,10:PRINT"7.5 V voltage at 1st stablilzer:"
1030 LOCATE 9,50:PRINT AU;" V"
1040 LOCATE 10,10:PRINT"9 V voltage at 2nd stabilizer:"
1050 LOCATE 10,50:PRINT AS;" V"
1060 LOCATE 11,10:PRINT"7.5 V voltage at 2nd stabilizer:"
1070 LOCATE 11,50:PRINT AW;" V"
1080 LOCATE 24,10:PRINT"press any key to continue";:A$=INKEY$:IF A$="" GOTO 1080
1090 GOTO 130
1100 '
1110 '
1120 'calculate M/W telemetry parameters
1130 '
1140 '
1150 '
1160 MK=K^2/5:MD=D:MO=.1*O:MG=20*G:MU=20*U:MS=S:MW=W
1170 '
1180 '
1190 'disolay data for M/W telemetry frame on screen
1200 '
1210 '
1220 CLS:LOCATE 1,20:PRINT"Channel (M)/(W) telemetry parameters:"
1230 LOCATE 5,10:PRINT"Output power of transponder:":LOCATE 5,50:PRINT MK;" mW"
1240 LOCATE 6,10:PRINT"Filling out of ROBOT QSO log:":LOCATE 6,50:PRINT MD
1250 LOCATE 7,10:PRINT"Power of turned-on heaters:":LOCATE 7,50:PRINT MO;" W"
1260 LOCATE 8,10:PRINT"Power of ROBOT transmitter:":LOCATE 8,50:PRINT MG;" mW"
1270 LOCATE 9,10:PRINT"Power of service channel transmitter:"
1280 LOCATE 9,50:PRINT MU;" mW"
1290 LOCATE 10,10:PRINT"Sensivity control for ROBOT transmitter:"
1300 LOCATE 10,50:PRINT MS;" dB"
1310 LOCATE 11,10:PRINT"Sens. control for serv. chan. trans. :";
1320 LOCATE 11,50:PRINT MW;" dB"
1330 LOCATE 24,10:PRINT"press any key to continue";:A$=INKEY$:IF A$="" GOTO 1330
1340 GOTO 130
```

eral passes. Look for a long-term trend. I have suggested this exercise because load current varies with such things as transponder load and the input power of each user into the satellite. It is probably the most variable of the telemetry data and usually shows changes more readily than any of the other parameters.

Voltage at the power source is also an interesting parameter to watch. It can indicate a satellite-damaging condition such as battery overcharge (usually fatal if prolonged or excessive). If the voltage suddenly changes, it is a good bet that the satellite has passed from daylight into darkness or vice versa. Most of the parameters are worth watching for long-term changes (monthly, seasonal, etc.). It can grow into an interesting pastime, much like keeping weather records. You can also pass the data along to AMSAT. They are always looking for telemetry information from amateur satellites.

Now that you are able to decode RS telemetry, try listening to the satellites on 29.500 and 29.450 MHz CW. You can do with it what you want, but in any case, have fun with the program and the data that you can obtain from it. You might even get more out of playing with the telemetry data than working people through the satellite! ■

The End of the Line

What's the point in sending power up the coax if it never reaches the antenna? These tips on connector installation and care will help maximize your station's signal.

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As supervisor of automation and communications systems on offshore oil platforms, I have learned that the following methods and materials produce long-lasting results even in salt-spray conditions on motor vessels and oil platforms in the Gulf of Mexico. If care is not exercised initially, moisture and improperly soldered coaxial rf connections can yield undesirable operation of your antenna system.

Cable Preparation

Proper soldering of the RG-8 shield to the barrel of a PL-259 coax connector can be accomplished by tinning the braid as shown in Photo A. Tin the circumference of the braid in an area that will be under the solder holes in the connector. Tinning must extend well forward of the solder holes to allow knife cutoff of braid and center insulation as shown in Photo B. Cutting through the soldered portion of the braid requires a sharp knife and considerable pressure. Work around the cable using a rocking motion of the knife blade rather than slicing.

Place the knurled connector nut over the coax with the threaded portion facing toward the prepared end. Apply a small amount of silicone grease or petroleum jelly to the black outer insulation and thread the connector onto the coax. Make sure the tinned area is in full view in all four holes of the connector and that the center conductor is in view for soldering.

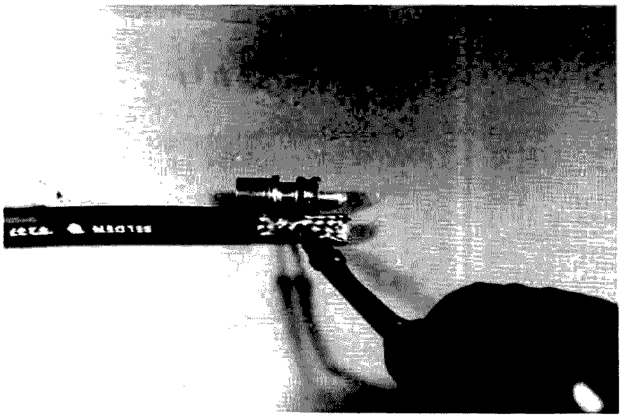

Photo A. Tin the braid in an area under the solder holes.

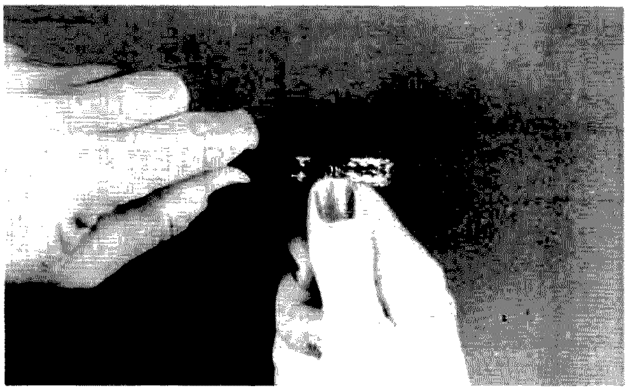

Photo B. Use a sharp knife to cut through soldered braid and insulation.

Photo C. Soldered connector with all holes filled. Use plenty of heat.

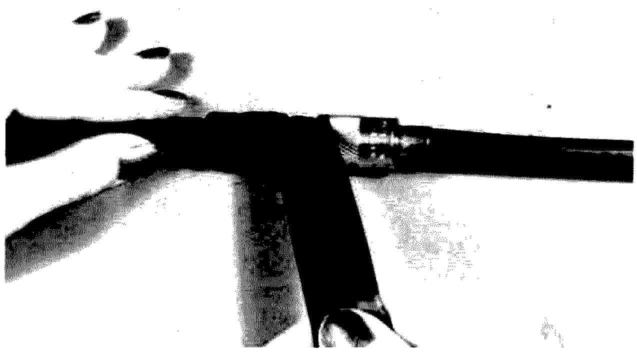

Photo D. Apply rubber tape with tension to conform to the irregular shape of connector.

Solder the Connector

Soldering must be done with enough heat to securely bond the coax shield to the connector. At least a 100-Watt soldering iron or gun is required to apply the necessary heat. Inadequate heat is responsible for most coax-connector problems.

Apply heat and then solder to each hole of the connector. Go from hole to hole around the connector with heat and solder. When the connector has absorbed enough heat, solder will freely flow into the holes and bond with the shield. It may take two or three passes in quick succession to achieve this. Next, solder the center conductor and allow to cool. The finished solder joints should be smooth and shiny—no solder beads or dull rough areas. See Photo C.

Now that your connectors are properly soldered, a check must be made to ensure that no shorts between the center conductor and shield have been created. A volt/ohmmeter, set on the 10k-Ohm range or higher and connected between center pin and body of the connector, should indicate infinite resistance if all is okay.

Protection Is a Must

Rf connectors used outside and exposed to the weather must be waterproofed to eliminate corrosion. Corroded connectors contribute to elevated swr and can radiate rf-causing TVI. A simple layer or two of vinyl electrical tape will *not* provide the necessary weather protection! The following method is used by radio technicians installing antenna systems in the Gulf of Mexico and can easily be applied by amateurs. I have used this method for eight years with no corrosion problems.

3-M Scotch® product numbers will be referred to, but other manufacturers' products are available to yield the same results.

Seal the Connector

The plug and receptacle portions of the connector must be joined firmly to provide a good electrical connection. The connector is now covered with a layer of Scotch No. 23 rubber splicing tape. Remove the protective backing and start wrapping 1/2" ahead of the connector on the coax. Stretch the tape at least twice its original length as you wrap, overlapping half the width of the tape, and continue the length of the connector. Be careful to fill voids and make the tape conform to the shape of the connector as in Photo D. This tape is both cohesive and adhesive and forms a solid covering.

A layer of Scotchkote® electrical coating is now applied liberally over the rubber tape for a sealer. See Photo E. This is a fast-drying liquid and imparts a waterproof seal. I have also used this type of sealant on bolted rf connections on antennas. It will coat the bolt and nut to retard corrosion and will allow removal of parts later. When the coating is almost tack free, start a layer of Scotch No.88 vinyl electrical tape on the coax just ahead of the rubber tape. The tape should be applied firmly with a slight amount of stretch. Continue down the connector, overlapping about half the tape width to the end, and then return in the opposite direction to the beginning. The last two wraps back at the beginning should be made with very little tension to avoid tape unwrap. Finally, one last coat of Scotchkote will seal the vinyl tape from moisture. Your finished product, in the case of a line splice, should look like Photo F.

This method should be used on all antenna connectors whether they be coaxial or coaxial cable terminated with screws and lugs. Also, many hams provide a splice connection at the tower to allow "fold-over." This splice should also be protected. ■

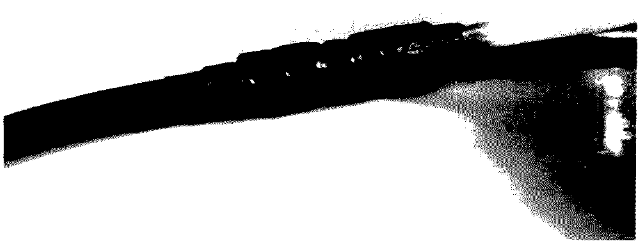

Photo E. Coat rubber tape with electrical sealer.

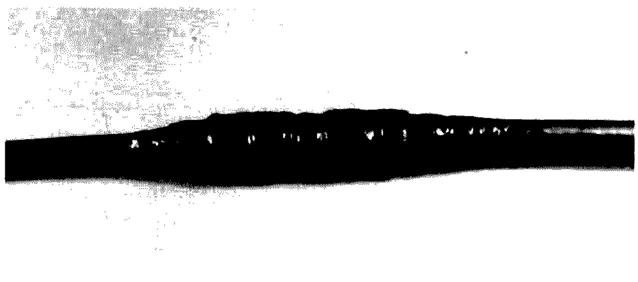

Photo F. Final covering of vinyl tape with outer coating of electrical sealer.

A Useful Present You Can Build

How about a high-tech holiday gift?

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Learning new technology can be a painful experience and breaking into digital electronics on your own can be positively frustrating. That is why I decided to get some help in my attempt to update to digital electronics and enrolled in some classes at San Diego City College. (Yes, California does have more than surf and sun!) By the end of the first semester I had learned a little, so I decided to combine the final laboratory project with my need for a Christmas gift for my wife. Since wives don't always appreciate electronic gadgets, I felt I should come up with something she would consider practical . . . without attempting something that would be too difficult.

Happily, my wife likes to cook. And, conveniently, her old-fashioned kitchen timer had recently failed. The obvious solution was to build her a kitchen timer (eminently practical) using digital circuitry, as required for the lab project. I decided this timer would not need to display seconds, nor would it require greater than 60 minutes capacity. Its alarm should be audible for 50 feet in a normal house (whatever that is) and its display should be visible for 20 feet so it could be seen across a normal kitchen. Battery operation would be convenient, and I decided to lay out the controls for a left-handed user since the cook in my house is left-handed.

Theory

The timer is built around an up/down counter driving a seven-segment LED display, as shown in Fig. 1. The counter is set by clocking it up using push-button switches in the control section and is clocked down by a one-pulse-per-minute signal from the clock. The alarm, which is triggered by the counter's zero count, is modulated by signals from the clock so as to reduce current consumption yet achieve the required audibility. The control section includes an automatic power-disconnect circuit to prevent draining the batteries

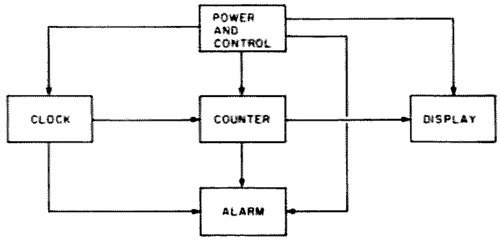


Fig. 1. Timer block diagram.

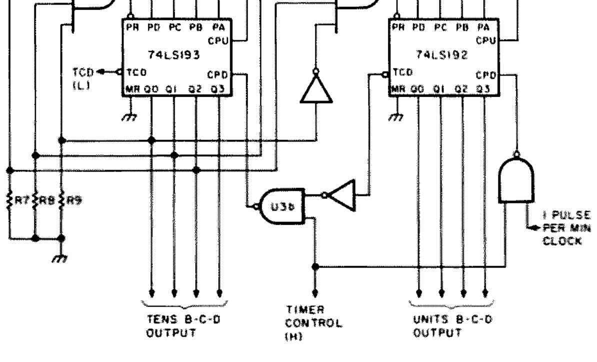


Fig. 2. Counter logic diagram.

by inadvertently allowing the alarm to sound excessively.

Circuit Description

The counter, shown in Fig. 2, utilizes two up/down binary counters in cascade. The units display requires a full decade, so a 74LS192 is suitable. The tens display requires only 0 through 6, so its counter is preset to zero by count 7 so that the timer cannot be set to more than 60 minutes. Using a 74LS193, whose count sequence includes 0 through 15, and wiring the preset gate, U4a, to force preset when the Q_0–Q_2 outputs are all high will cause preset on count 7 or count 15. The counter will then be forced to operate between 0 and 6 as it cannot be clocked up beyond 6 or down beyond 0.

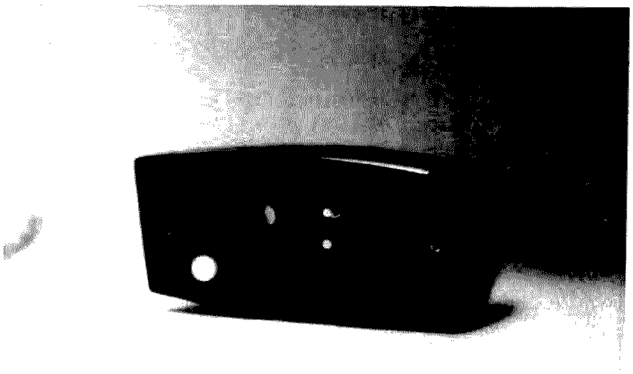
U4b is wired as a preset gate to force the units counter to zero when the timer is being set and the tens counter is at 6. This establishes 60 minutes, rather than 69, as the maximum timer capability. U4b is disabled in Timer mode when the Set control line goes low so as to allow the units counter to be clocked down normally. Otherwise the units counter would be locked at zero by the tens counter's 6, preventing the application of clock pulses to the tens counter, locking the timer at 60.

R7, R8, and R9 are pull-down resistors for the inputs of U4b. This was found to be necessary in order to prevent presetting on the 6 count due to "racing." Evidently, between count 5 (binary 0101) and count 6 (binary 0110), Q_0 was not going low before Q_1 went high, so the preset gate interpreted the 6 as a 7. The pull-down resistors cured the problem.

All clock lines must be held low when switching modes in order that their associated NAND gates be disabled. This will hold the clock inputs to the counters high during mode changes, thus preventing spurious clocking when switching modes.

The 74LS192/LS193 counters are designed to be cascaded by connecting the TC output of one directly to the CP input of the next. U3b, the Mode gate, inverts the TC_D signal before it reaches the CP_D input of the tens counter, so an inverter must be included in the signal path to restore the proper polarity. Without the inverter, the count is 50, 59, 58, etc.

Fig. 3 shows the waveforms of the counter in Timer mode with the units counter clocked by a symmetrical square wave whose period is 1 second. The Q outputs of the 74LS192/LS193 change states on the low-to-high clock transition. The TC_D output goes low with the low portion of the clock pulse when all its Q outputs are low. In Timer mode, counting down, the binary output of the units counter changes to 0000 with the rising edge of the 0 clock pulse. The falling edge of that pulse, 30 seconds later, causes the units TC_D to go low. 30 seconds later, the clock pulse again goes high, clocking the units counter to its 9 count and forcing the TC_D back to its high state. As the units TC_D goes high, it clocks the tens counter.



Digital kitchen timer in use.

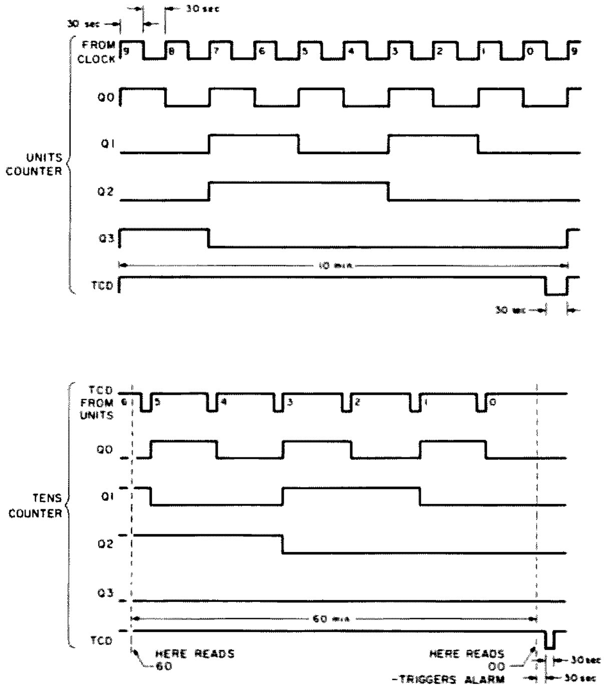


Fig. 3. Counter waveforms.

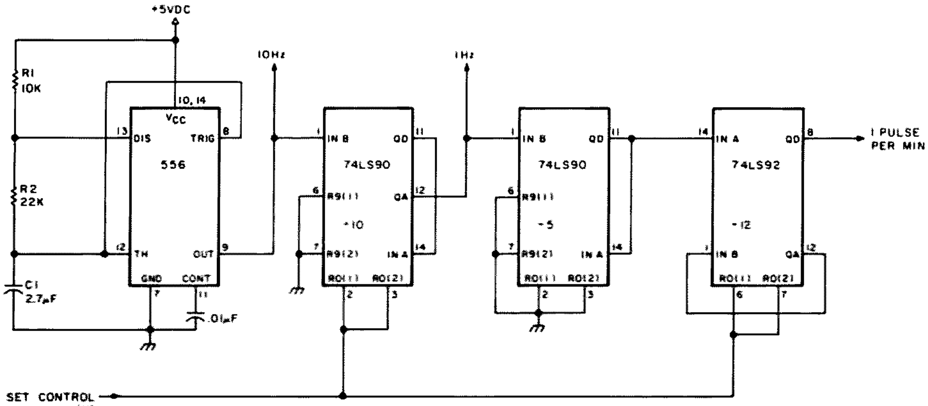


Fig. 4. Clock-generator logic diagram.

Parts List

C1	Capacitor, tantalum, 2.7 uF	$ .60	U1	74LS192	.95
C2, C4-7	Capacitor, disc, .01 uF	.20	U2	74LS193	.95
C3	Capacitor, tantalum, 4.7 uF	.70	U3, 6, 7, 13	74LS00	.38
C8	Capacitor, tantalum, .1 uF	.50	U4	74LS20	.38
D1	LED, red	.30	U5	74LS04	.38
J1	16-pin DIP socket	.45	U8	LM556	1.50
J2	2-pin socket	.50	U9, U10	74LS90	.66
K1	Relay, 5-V coil, Radio Shack 275-243	2.50	U11	74LS92	.66
P1	16-pin DIP plug	1.70	U12	74LS02	.38
P2	2-pin plug	.50	U14, U16	74LS48	1.10
R1	Resistor, 10k, 1/4 W	.03	U15, U17	Seven-segment, common cath. display	
R2	Resistor, 22k, 1/4 W	.03		(MAN 74)	1.60
R3	Potentiomenter, 1k, Radio Shack 271-333	.50	U18	+5-volt regulator, LM340T-5 (7805)	1.60
R4	Resistor, 1 M, 1/4 W	.03	Piezo sounder, Radio Shack 273-060		3.00
R5, R7-9	Resistor, 330 Ohms, 1/4 W	.03	Battery holder, 4 × AA cell		1.00
R6	Resistor array, 5 × 1k, Radio Shack		Enclosure		5.00
	271-096	.90	Grid board, 2 pieces 2-3/4" × 3-3/4", Radio Shack 276-161		3.00
S1	Switch, PB, DPDT (push-on/push-off)	2.00	IC sockets, solder-in (optional), 18 required		.45
S2, S3	Switch, PB, SPDT (momentary)	1.60	(Prices as of January, 1984)		

The BCD output from the counter section drives the seven-segment display decoders. Besides the 74LS48 decoders and the MAN-74 displays, the display section also includes a single LED which is driven by a 1-Hz pulse from the clock to serve as a Timer mode indicator.

The alarm section consists of a Radio Shack piezo sounder and appropriate gating. The Set control line, Q_0–Q_3 from the units counter, and Q_0–Q_2 from the tens counter must all be low in order to enable the alarm. When enabled, U6c holds the sounder's positive lead high. The sounder's negative lead is connected to a NAND gate/inverter combination that combines a 1-Hz square wave with a 10-Hz square wave. When these signals are both high, the negative lead is held high and the sounder is off. When either signal is low, the sounder will be energized. The result is a tone of about 5 kHz that is keyed at a 1-Hz rate and modulated at a 10-Hz rate.

The timer requires clock signals of 1 pulse per minute to drive the counter, 1 pulse per second the key the alarm, and 10 pulses per second to modulate the alarm. These signals are produced by a divider chain driven by an astable multivibrator, as shown in Fig. 4. The multivibrator output is a nonsymmetrical square wave whose high time, t_1, is 60 ms and whose low time, t_2, is 40 ms. The period, $t_1 + t_2$, is 100 ms and the frequency is thus 10 Hz. These times are determined by the following relationships: $t_1 = 0.693 (R_1 + R_2) C_1$; $t_2 = 0.693 \times R_2 \times C_1$. The 10-Hz signal from the multivibrator is used to modulate the alarm as well as serving as the input for the divider chain. The 1-Hz signal from the divide-by-ten stage is also applied to the alarm. When the Set control is high, in Set mode, the 74LS92 and the first 74LS90 will be disabled by the high applied to their R_0 inputs and the clock output will be held low. As mentioned previously, this is necessary to prevent spurious clocking when switching modes. Fig. 5 illustrates the clock-generator waveforms.

Power from four AA cells is applied to the circuit

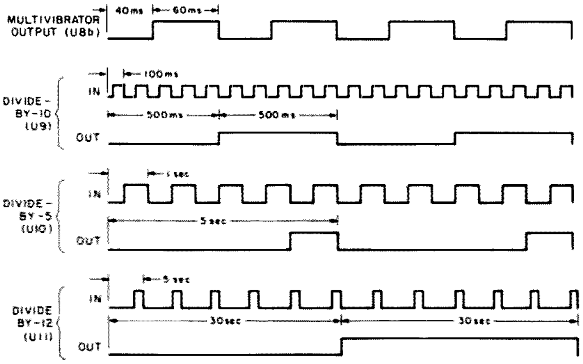


Fig. 5. Clock waveforms.

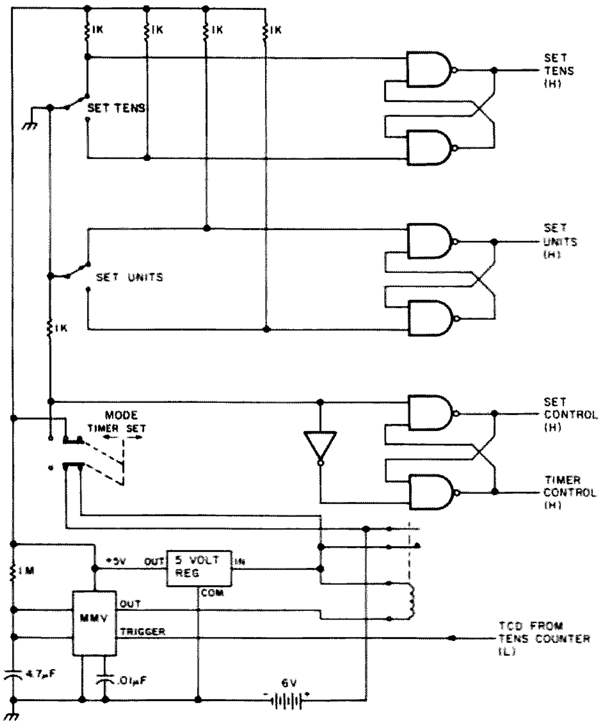


Fig. 6. Power and control logic diagram.

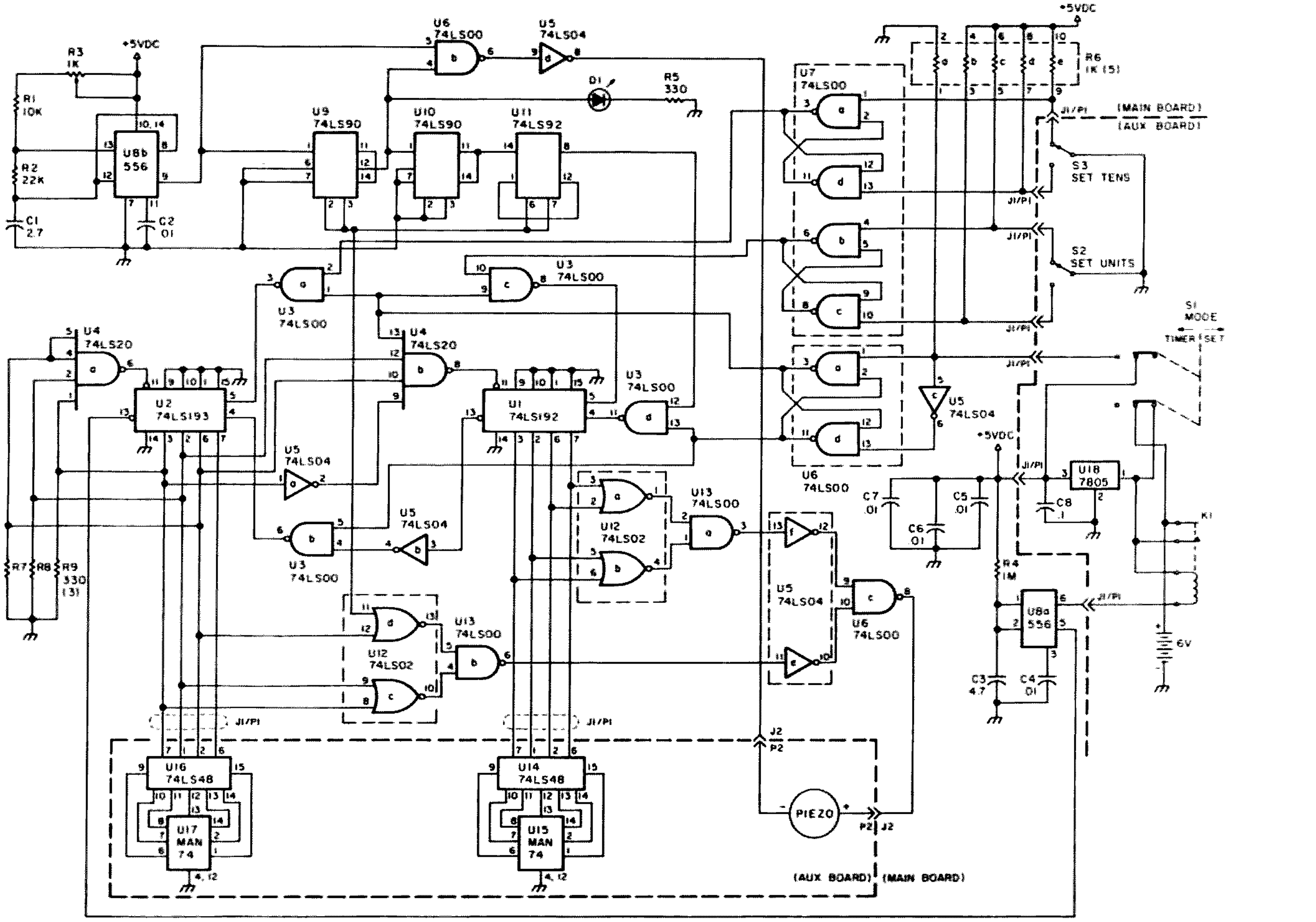


Fig. 7. Timer schematic diagram.

through normally-open relay contacts, as shown in Fig. 6. Placing the timer in Set mode applies power to the circuitry, providing a path to ground for the relay by energizing the monostable multivibrator. The relay, once energized, latches power to the circuitry even though the mode switch is moved to Timer. The positive transition of the last 0 pulse from the clock drives the counter to all zeros, triggering the alarm. 30 seconds later, the clock's 0 pulse goes low, causing the units TC_D to go low. When the units TC_D goes low, the tens TC_D is driven low. The low TC_D from the tens counter, which comes 30 seconds after the alarm sounds, triggers the monostable multivibrator. This drives the multivibrator output high, causing the relay to open, which provides the automatic shut-off feature after a 30-second alarm period. The period of the multivibrator, determined by the resistor/capacitor combination, is not critical as long as it is sufficient to allow the relay to open.

Push-button switches, debounced by NAND gates, are provided to permit setting the two counters individually. These are wired so as to hold the Set lines normally low to prevent spurious clocking when changing modes. Mode control is provided by an R-S flip-flop circuit controlled by contacts on the push-on/push-off mode switch. The mode-control signals, which are active high, are thus guaranteed to be complementary.

Construction

The timer is constructed in two units so as to fit a relatively compact enclosure, as indicated by the Main board/Aux. board divisions on the schematic diagram (Fig. 7). The main circuit board, shown in Fig. 8, includes the clock, the counters, the alarm gating, and the Timer indicator LED. The auxiliary circuit board, shown in Fig. 9, includes the control switches, the digital display, the piezo sounder, the battery pack, and the voltage regulator. These two boards are interconnected by means of a 16-conductor flat cable through J1/P1 and a 2-conductor cable through J2/P2. Though indicated together on the schematic, the decoupling capacitors (C5, C6, and C7) are spread out along the IC power bus.

I housed the timer in a black plastic case I chanced

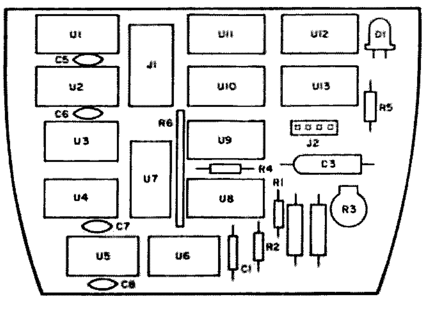


Fig. 8. Main circuit-board layout.

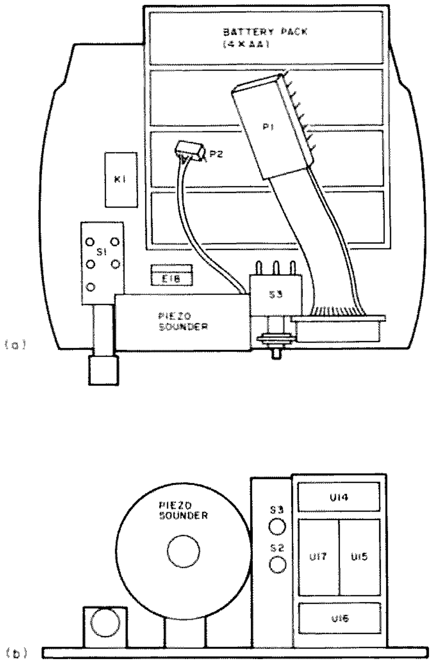


Fig. 9. Auxiliary circuit-board layout.

upon in a local surplus-electronics store, which is the reason for the strange shape of the circuit boards. The front panel is a red Plexiglas™ sheet through which the display is clearly visible. The controls have been arranged on the left side so that a left-handed cook can operate the timer without blocking the view of the display. The completed timer is shown in Fig. 10.

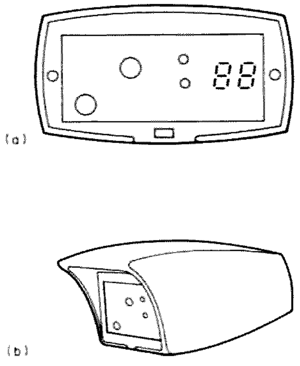


Fig. 10. Kitchen-timer views.

Conclusion

The timer has proven to be quite convenient to use. Pressing the mode switch latches the timer in the Set mode, allowing the user to clock the display up to the desired setting using the Set push-buttons. Setting the timer beyond its upper limit of 60 minutes returns it to zero, so setting errors can be corrected. Pressing the mode switch a second time releases it and places the timer in the Timer mode. A flashing LED indicates that the timer is functioning in this mode. The LED display is visible for a distance of 20 feet, except in very bright light. When the display reaches zero, an alarm sounds for 30 seconds, then the timer automatically turns off. The alarm is audible for a distance of 50 feet through several rooms in a house with carpeted floors.

Current drain from fresh batteries was measured as less than 150 mA, so battery operation is practical for occasional use. I have found it necessary, though, to install an ac adapter because my children like to play with Mom's kitchen timer—which suggests ideas for next Christmas! ■

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Ham Over Fist

Here's a VIC-20 CW program with a twist: Its real-time display lets you watch your dits and dahs dance across the screen. But be forewarned—you may not like what you see!

```
10 REM       CW BANNER PROGRAM.....VIC-20 VERSION
20 REM
30 REM       BY DENNIS C. FAIT
40 REM       PO BOX 22
50 REM       SLIPPERY ROCK,PA
60 REM
70 REM
80 PRINT "{CLR}"
90 REM RESERVE SPACE FOR MACHINE LANGUAGE PROGRAM
100 REM AND CHARACTER GENERATOR
110 POKE 52,26:POKE 56,24
120 REM TURN UP VOLUME
130 POKE 36878,15
140 REM FILL ONE LINE ON SCREEN
150 PRINT "{10 DOWN}@ABCDEFGHIJKLMNOPQRSTU"
160 REM PUT CHARACTER GENERATOR AT 7168D
170 POKE 36869,255
180 REM CLEAR CHARACTER GENERATOR WITH NULLS
190 FOR X=7168 TO 7679:POKE X,0:NEXT
200 AD=6630:REM BEGINNING ADDRESS OF ML PROGRAM
210 READ B:IF B=999 THEN SYS 6630
220 POKE AD,B:AD=AD+1
230 GOTO 210
240 REM
250 REM
260 DATA 32,91,26,162,8,160,23,136,240,47
270 DATA 189,0,28,24,42,144,20,32,73,26
280 DATA 189,0,28,56,42,157,0,28,32,82
290 DATA 26,32,82,26,76,237,25,32,73,26
300 DATA 189,0,28,24,42,157,0,28,32,82
310 DATA 26,32,82,26,76,237,25,32,106,26
320 DATA 173,9,144,201,255,208,16,173,176,28
330 DATA 56,42,141,176,28,169,225,141,12,144
340 DATA 76,230,25,173,176,28,24,42,141,176
350 DATA 28,169,127,141,12,144,76,230,25,202
360 DATA 202,202,202,202,202,202,96,232,232
370 DATA 232,232,232,232,232,232,96,32,159,255
380 DATA 32,228,255,201,0,240,3,141,105,26
390 DATA 96,0,138,72,152,72,174,105,26,160
400 DATA 255,136,208,253,202,208,248,104,168,104
410 DATA 170,96
420 DATA 999
430 END
```

Listing 1. VIC-20 Basic-language CW Banner program. The program initializes the screen and various memory pointers and nulls the new character-generator table before poking the machine-language program into memory. Execution is then transferred to the machine-language program.

Did you ever wonder just what your CW fist sounds like? I'm sure some of you have had a friend tape-record your signal from the air, but have you ever *seen* your fist? ("Why, of course," you answer. "Now do you want to *feel* my fist?")

Before you get hostile, please let me explain the little program in this article.

My CW Banner program is written for the unexpanded Commodore VIC-20 computer and will display on your television screen the dots and dashes received by your HF rig. As a bonus, it will do it in high-resolution graphics.

What you'll see when you run this program is a series of dots and dashes appearing on the right side of the screen and smoothly moving across the screen to the left side. As more elements appear on the right, older elements will disappear on the left. And that isn't all: The VIC will also beep the television audio in time with the dots and dashes.

This program can be a useful tool also for deaf hams who still want to work with dots and dashes and for displaying other TTL signals (with certain timing re-

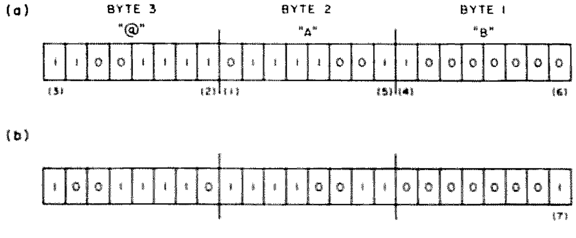

Fig 1. Example of how the first byte of each 8-byte character definition in the character generator is modified to roll dots and dashes to the left.

straints on the top end).

Fist still curled, you ask, "Well, how do we do all of that?"

I'm glad you asked.

Program Explained

To get the resolution we want from the VIC, we must change its character-generator pointer to point to RAM instead of ROM and then dynamically change what is in that RAM to define the dots and dashes we wish to see.

The ROM character-generator table contains eight bytes for each character that the VIC is capable of displaying. Each of the eight bytes defines one line of eight pixels in the 8 × 8 character grid. The table begins with the @ character and then continues with the alphabet, numerics, and graphic characters.

All we need to do is redefine one line in each of the first 22 characters in the RAM character generator (@ through U), setting a bit if a CW signal is present and resetting it if there is no signal.

Take a look at (a) in Fig. 1. This represents a simplified screen only three characters wide which I'll use to explain what the program does. Our three characters on the screen are @, A, and B. The program looks at the most significant bit (MSB) of byte 2. If it is low (1), then it resets the least significant bit (LSB) of byte 3 (2). If byte 2's MSB is high, then the LSB of byte 3 is set. In either case, the byte is then rotated one bit to the left and poked back into the character-generator table in RAM. The program then skips to the next byte, byte 1, and does the same thing (4 and 5). The POTY pin of the joystick port is then checked for a signal. If it is low (indicating a signal is present), the LSB of byte 1 is set, otherwise it is reset (6 and 7). Byte 1 is rotated left and poked.

I should remind you that the bytes we're messing with above are the first of the eight bytes that define each character. The other seven bytes were previously nulled by the Basic program and are not used. They remain transparent so that the only things visible are the dots and dashes that are defined by the first byte.

In Fig. 1, (b) shows the screen after the dots and dashes have been moved to the left by one pixel.

```
*** PASS ONE ***


*** PASS TWO ***
0000              0010 * FILENAME--> CWBANNER.S
0000              0020 *
0000              0030 *
0000              0040 * CW BANNER PROGRAM FOR VIC-20
0000              0050 *
0000              0060 * BY DENNIS C. FAIT
0000              0070 * PO BOX 22
0000              0080 * SLIPPERY ROCK, PA. 16057
0000              0090 *
0000              0100 * The following assembled object code is contained within
0000              0110 * the DATA lines of the accompanying BASIC program.
0000              0120 *
0000              0130 *
0000              0140 CHARGEN     EQU   $1C00      ;CHAR GENERATOR RAM
0000              0150 LASTCHAR    EQU   $1CB0      ;LAST CHAR USED IN CHARGEN
0000              0160 SCNKEY      EQU   $FF9F
0000              0170 GETIN       EQU   $FFE4
0000              0180 TONE3       EQU   36876      ;SOPRANO TONE ADDRESS
0000              0190 POTY        EQU   $9009      ;POT Y ADDRESS
0000              0200 *
19E6              0210             ORG   $19E6
19E6              0220 *
19E6  20 5B 1A    0230 BEGIN       JSR   GETDELAY
19E9  A2 08       0240             LDXI  $8         ;INITIAL OFFSET
19EB  A0 17       0250             LDYI  $17        ;DO FOR 22 CHARS
19ED  88          0260 START       DEY              ;DECR. CHAR COUNTER
19EE  F0 2F       0270             BEQ   RITECHAR
19F0  BD 00 1C    0280             LDAX  CHARGEN    ;GET CHAR SPECS.
19F3  18          0290             CLC
19F4  2A          0300             ROLA             ;ROTATE MSB7 INTO CARRY
19F5  90 14       0310             BCC   RESETBIT   ;IF CARRY CLEAR GOTO
19F7  20 49 1A    0320 SETBIT      JSR   DEC
19FA  BD 00 1C    0330             LDAX  CHARGEN    ;GET CHAR TO LEFT
19FD  38          0340             SEC
19FE  2A          0350             ROLA             ;SET BIT 0 IN LEFT CHAR
19FF  9D 00 1C    0360             STAX  CHARGEN    ;AND POKE NEW CHAR AT LEFT
1A02  20 52 1A    0370             JSR   INC
1A05  20 52 1A    0380             JSR   INC
1A08  4C ED 19    0390             JMP   START
1A0B  20 49 1A    0400 RESETBIT    JSR   DEC
1A0E  BD 00 1C    0410             LDAX  CHARGEN
1A11  18          0420             CLC
1A12  2A          0430             ROLA             ;RESET BIT 0 IN LEFT CHAR
1A13  9D 00 1C    0440             STAX  CHARGEN    ;AND POKE IT
1A16  20 52 1A    0450             JSR   INC
1A19  20 52 1A    0460             JSR   INC
1A1C  4C ED 19    0470             JMP   START
1A1F  20 6A 1A    0480 RITECHAR    JSR   DELAY
1A22  AD 09 90    0490             LDA   POTY       ;GET PORT DATA
1A25  C9 FF       0500             CMPI  $FF        ;FF IF SIGNAL PRESENT
1A27  D0 10       0510             BNE   RITE1
1A29  AD B0 1C    0520             LDA   LASTCHAR
1A2C  38          0530             SEC
1A2D  2A          0540             ROLA
1A2E  8D B0 1C    0550             STA   LASTCHAR
1A31  A9 E1       0560             LDAI  $E1
1A33  8D 0C 90    0570             STA   TONE3      ;TURN ON TONE
1A36  4C E6 19    0580             JMP   BEGIN
1A39  AD B0 1C    0590 RITE1       LDA   LASTCHAR
1A3C  18          0600             CLC
1A3D  2A          0610             ROLA
1A3E  8D B0 1C    0620             STA   LASTCHAR
1A41  A9 7F       0630             LDAI  $7F
1A43  8D 0C 90    0640             STA   TONE3            ;TURN OFF TONE
1A46  4C E6 19    0650             JMP   BEGIN
1A49  CA          0660 DEC         DEX
1A4A  CA          0670             DEX
1A4B  CA          0680             DEX
1A4C  CA          0690             DEX
1A4D  CA          0700             DEX
1A4E  CA          0710             DEX
1A4F  CA          0720             DEX
1A50  CA          0730             DEX
1A51  60          0740             RTS
1A52  E8          0750 INC         INX
1A53  E8          0760             INX
1A54  E8          0770             INX
1A55  E8          0780             INX
1A56  E8          0790             INX
1A57  E8          0800             INX
1A58  E8          0810             INX
1A59  E8          0820             INX
1A5A  60          0830             RTS
1A5B              0840 *
1A5B  20 9F FF    0850 GETDELAY    JSR   SCNKEY           ;SCAN KEYBOARD
1A5E  20 E4 FF    0860             JSR   GETIN            ;GET CHAR
1A61  C9 00       0870             CMPI  0                ;NULL?
1A63  F0 03       0880             BEQ   GTDY1            ;YES
1A65  8D 69 1A    0890             STA   DELAYVAL         ;ELSE SAVE IT HERE
1A68  60          0900 GTDY1       RTS
1A69              0910 *
1A69              0920 DELAYVAL    DB    0                ;STORE DELAY VALUE HERE
1A69  00
1A6A              0930 *
1A6A  8A          0940 DELAY       TXA                    ;PUT X INTO A
1A6B  48          0950             PHA                    ;PUSH A
1A6C  98          0960             TYA                    ;PUT Y INTO A
1A6D  48          0970             PHA                    ;PUSH A
1A6E  AE 69 1A    0980             LDX   DELAYVAL         ;GET DELAY VALUE INTO X
1A71  A0 FF       0990 DELY1       LDYI  $FF              ;INIT Y DELAY VALUE
1A73  88          1000 DELY2       DEY
1A74  D0 FD       1010             BNE   DELY2
1A76  CA          1020             DEX
1A77  D0 F8       1030             BNE   DELY1
1A79  68          1040             PLA                    ;POP A
1A7A  A8          1050             TAY                    ;A INTO Y
1A7B  68          1060             PLA                    ;POP A
1A7C  AA          1070             TAX                    ;A INTO X
1A7D  60          1080             RTS
```

Listing 2. The object code produced by this program is contained within the DATA lines of the program in Listing 1. Mnemonics used in this listing are a modified form of those commonly used. (The "I" attached to some of the above mnemonics (LDXI, for example) means "immediate." ROLA means "rotate the contents of the accumulator left one bit," as opposed to ROLX, which does the same to the X register.)

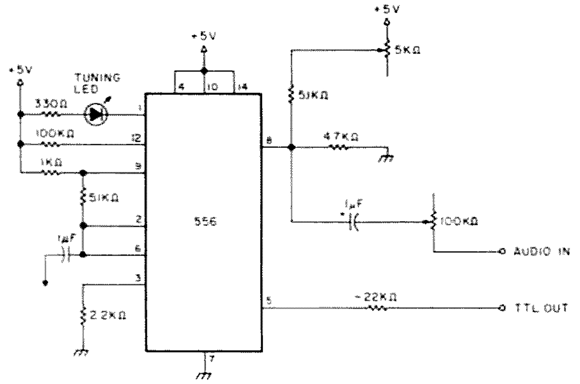

Fig. 2. Usable interface for converting your HF rig's audio to a TTL signal for the VIC-20. Do not omit the 22k resistor at the output.

In addition to redefining our 22 characters, the program will turn the audio on and off (see lines 560, 570, 640, and 650 in the assembly listing). This is an advantage if your rig's audio is muted or disappears because you have stuck a patch cord into the headset/external speaker jack.

One other desirable feature included is the ability to vary the speed of the characters moving across the screen. All you need to do is touch any of the keys on the keyboard to affect the speed. The letter keys are among the slowest, while RETURN and RUN/STOP are the fastest. The faster the code is coming from the rig, the faster you'll want the display to move; otherwise, the dots and dashes will be very short and hard to see. However, the slower the display speed, the more dots and dashes that can be displayed on the screen at one time.

The Basic program (Listing 1) does the following:

- In line 110, a part of RAM is reserved for the machine-language program. Line 170 turns up the sound. Then in line 150, twenty-two characters are printed across the screen. These are the characters which will be redefined as dots and dashes.
- Next, in line 170, the character-generator table is moved to RAM and line 190 fills the table with zeros.
- Last, lines 210-230 poke the machine-language program into memory and then transfer control to that program.

Hardware Required

The program as written may not be compatible with Kantronics' hardware. But changing the value of POTY in line 190 of the assembly listing to the input address that Kantronics uses and (if necessary) the logic used in the RITECHAR routine beginning at line 480 should do the trick.

For those of us who like to go our own way, Fig. 2 is the circuit I'm using to convert the rig's audio to the +5/0-volt signal that the VIC requires. Be sure to include the 22k-Ohm resistor in series (as shown) between this circuit and the VIC.

Kudos

I'd like to thank Skeeter N3HB for the original idea for the CW Banner project. His was written for a homebrew 6800 machine. I wrote the 6502 version for the VIC after gaining experience writing one for an 8085/TMS9918A home brew. ■

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Homemade Defroster Shutoff

This simple gadget has nothing to do with amateur radio, but it's a neat little project anyway.

Is your car equipped with an electric rear-window defroster grid? Have you ever turned it on and forgotten about it until several days later? No? then don't bother reading any further.

Being somewhat absent-minded, this problem has been with me for years. I finally became motivated to build some type of automatic shut-off circuit when I purchased a new car. This car had a factory-installed defroster that was controlled by an on/off switch without a shut-off feature, and I felt my new "toy" deserved better than that. The original control scheme is shown in Fig. 1.

My old car was equipped with a fan that cleared the rear window by blowing the car interior's air at it. Marginal performance and a desire to mount a hi-fi speaker in its place had resulted in replacing the fan with a stick-on grid defroster. This after-market unit did not have a relay to control the defroster power; all the current flows directly through the switch.

Since I had decided to build a timer circuit, it seemed a good idea to install a similar design for this after-market, relay-less defroster.

As a first step, several design goals for the timer were developed. (1) The existing defroster was not to be altered, other than to cut wires. (2) There was to be no power consumption when the power-control switch was off. (3) The existing pilot light should indicate when power was applied to the defroster grid. (4) It should be possible to reset or turn off the defroster timer at any time. (5) The circuit should be able to cope with power-supply variations and noise.

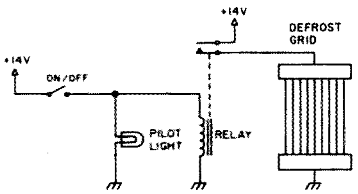

Fig. 1. The existing defroster circuit.

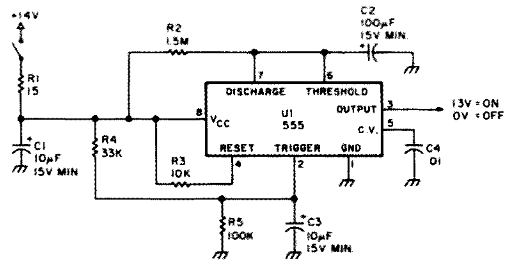

Fig. 2. Schematic of the timer circuit.

Circuit Description

Fig. 2 shows the circuit that evolved from the design goals. A 555 timer chip was chosen as the control element. R2 and C2 are the timing components. The values shown produce an on-time of approximately four minutes. This has proven to be adequate for most situations. Increasing the value of R2 will increase the on-time, and vice versa. The relationship between R2 and the on-time is roughly linear: doubling R2 doubles the on-time.

I have shown power-supply connections as going to +14 V. These connections are really to the positive side of the car's battery, and the voltage may not be exactly 14. The circuit will function over a wide range of supply voltages, however, so this is not a problem.

The 555 is triggered by a low voltage (less than one third the supply) at pin 2. C3 and R4 ensure a low voltage at pin 2 for a fraction of a second after power is applied. R5 guarantees a rapid discharge of C3 when power is removed, allowing the circuit to be reset and restarted quickly. R1 and C1 are a simple supply filter. The output of the 555 (pin 3) will be at zero volts when off (or when power is removed) and at about one volt less than the supply voltage when on.

There are at least three ways to configure the defroster drive circuit (R6, Q1, B1, K1). Figs. 3(a), 3(b), and 4 show the choices. With the circuit of Fig. 3(a), the exact timer output voltage does not make much difference; the key is to drive Q1 into saturation. When Q1 is saturated, its collector-to-emitter voltage is very small, so the voltage applied to the relay and indicator light is nearly the supply voltage. In addition, power dissipation in the transistor will be minimized.

If the circuit of Fig. 3(b) is used, Q1 will not be driven into saturation but will act like a large-signal emitter follower. Available drive for the relay will be about 2 volts less than the supply voltage due to the base-emitter drop across Q1, the drop in R6, and the limited maximum voltage at the 555 output. Power dissipation in Q1 will be increased be-

cause of increased collector-to-emitter voltage.

I recommend using the circuit of Fig. 3(a) when possible, but when the connections to the relay coil are difficult to access, it may be easier to use the configuration of Fig. 3(b).

Use Without a Relay

Due to the high current in most grid-type defrosters (10 Amperes or more), it is not advisable to drive the defroster directly with this circuit. If it is desired to eliminate the relay, the circuit shown in Fig. 4 may be employed. The added transistor, Q2, is to boost the current applied to the base of Q1 to ensure that it is saturated (minimum power dissipation). Q1 still may dissipate several Watts, so a heat sink should be used.

Construction

Layout and construction style are not critical. I chose to use a small piece of punched phenolic board for the timer and point-to-point wiring.

R2 and C2 are the only components with somewhat critical values. Most other components can be of whatever values exist in your junk box. Every one of the timers I have constructed used different component values! Just make sure Q1 will saturate and that the potential on pin 2 of the 555 will rise above 5 volts after C3 charges.

Installation

Finding a convenient location for the timer may be the most difficult part of the project, especially if a factory-installed defroster and switch are to be modified. There is usually very little extra space behind the dashboard, and Murphy's Law says that if there is extra space it will be located so as to be least useful.

If a relay is not used, an acceptable solution might be to mount the timer right at the defroster grid's terminals or just on the other side of whatever hole the wires go through. Since the circuit can be made reasonably small, it might not be objectionable if left in the open.

After-market add-on defrosters should make for an easier job. There is probably enough room near the switch to install the circuit.

Many defroster switches have an indicator light incorporated into the same package. A suggested method for using this type of switch/light combination is shown in Fig. 5.

As with any electronics, care should be taken to install the circuit so that it will not accidentally contact metal and short out. I chose to let the circuit be supported by its connecting wires and insulated it by wrapping it in several layers of electrical tape.

Final Comments

All three timer circuits have been tested in my cars. Although the timer chip I used (an NE555) is rated for the "commercial" temperature range—zero to 70 degrees centigrade—the circuit still worked well when temperatures dropped to about minus 15° C. A military temperature range (−55° to +125° C) version, an SE555 for example, would increase low-temperature reliability, but I have not been able to locate a source for this version. ■

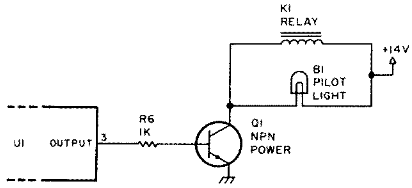

Fig. 3(a). Preferred output circuit.

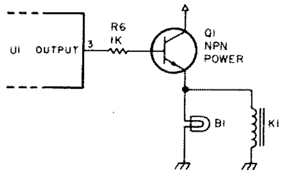

Fig 3(b). Alternative output circuit for use when relay is hard to access.

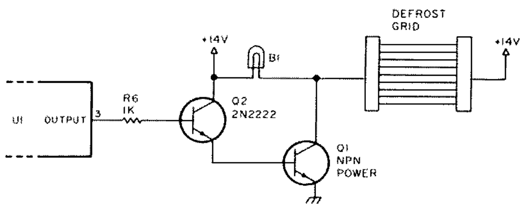

Fig. 4. Output circuit for a relay-less system.

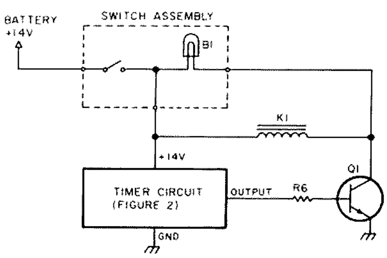

Fig. 5. Taking advantage of a combined switch/light assembly.

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RTTY LOOP

Marc I. Leavey, M.D. WA3AJR
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Pikesville MD 21208

Chalk up another victory for the pirates. Calm down Pittsburgh, not the ones that played our Orioles a few years back, I am talking about the software variety.

I have been gently nudging my acquaintance out west, Clay Abrams, to try to adapt some of his CoCo® RTTY software to the newer versions of the TRS-80C Color Computer® and to add disk capabilities. Well, Clay has written me that, for a variety of reasons, such a version will not be forthcoming. One of the major reasons that Clay has come to this decision is that there appears to be a huge number of bootlegged copies of his tape-based programs in circulation. Huge, that is, when compared to the number he has sold. So Clay has come to the conclusion that it is not worth investing large amounts of time and sweat into a program only to have it circulated "freebie-style" between buddies. Flattery is nice, but it don't pay the bills.

So look for more of Clay's work not in a catalog, but in the pages of this and other magazines. By publishing what he writes, he can realize a return on his effort and make the information available to interested individuals.

As for my efforts along the same lines, I am continuing to dabble and will either publish a set of routines here (in serial fashion) or try to organize them into an article for independent publication. Stay tuned.

Along these lines, regards to Frank Fields KB0QJ who is using a CoCo under Clay's original program. Keep up the spirits, Frank. With the capabilities inherent in the CoCo, I am sure that a program will appear on the scene which will run rings around those available for other small computers.

Along the line of useful tidbits comes a letter from Ocean City, Maryland. In this vacation haven of Maryland lives Jim Conner W3HCE, an old-time RTTY buff from the "old school," as he puts it. Jim is an active amateur on the Maryland eastern shore, using a local two-meter repeater for VHF RTTY operation. He picked up the new Heathkit HD-3030 RTTY terminal interface. This $250 box is a combined terminal unit and AFSK generator, sort of a RTTY modem, which appears to have great capabilities (according to the catalog blurb). Maybe I can convince Benton Harbor to spring for some more information on it in the future.

Anyway, Jim thought that the utility of the HD-3030 would be enhanced if an interface between it and his piles of ham gear could be designed. His intent was to be able to operate either on Morse or RTTY on both the HF and VHF bands, allowing for monitoring of the signals and control of the transmitter push-to-talk (PTT) line; features which the HD-3030 lacks.

Attacking the PTT problem head on, Jim found that while the voice-operated transmit switch (VOX) on most HF transmitters allowed operation unmodified with that mode, there was no convenient way to key the PTT line on the VHF transmitter. Digging into the HD-3030 revealed that the send-receive push-button is a double-pole switch, with only one pole being used. Running a wire from the unused side of the switch to pin 23 on the DB-25 connector, an unused pin, and to ground on the other side of the switch provided a convenient added PTT switch, appropriately labeled, with minimal modification to the HD-3030 itself.

He then used a four-position, seven-pole rotary switch to select which of four modes—VHF MCW, VHF RTTY, HF CW, or HF RTTY—is to be operated. The switch used is a Centralab PA-1027, an eight-pole, five-position switch which is only partially used. You may have to try some of the larger parts jobbers in your area to find this switch. To help shield the

PARTS LIST

Cabinet		
1	Switch, rotary, Centralab PA-1027 (8 Pole, 5 Position)	
1	Cabinet	270-269
2	4-pin mike sockets	274-002
2	4-pin mike plugs	274-001
5	Phono sockets	274-346
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1	330-Ohm, 1/4-Watt resistor	271-1315
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1	10k-Ohm, PC-type potentiometer	271-218
2	0.0047-μF mylar™ capacitors	Jameco MY.0047/100

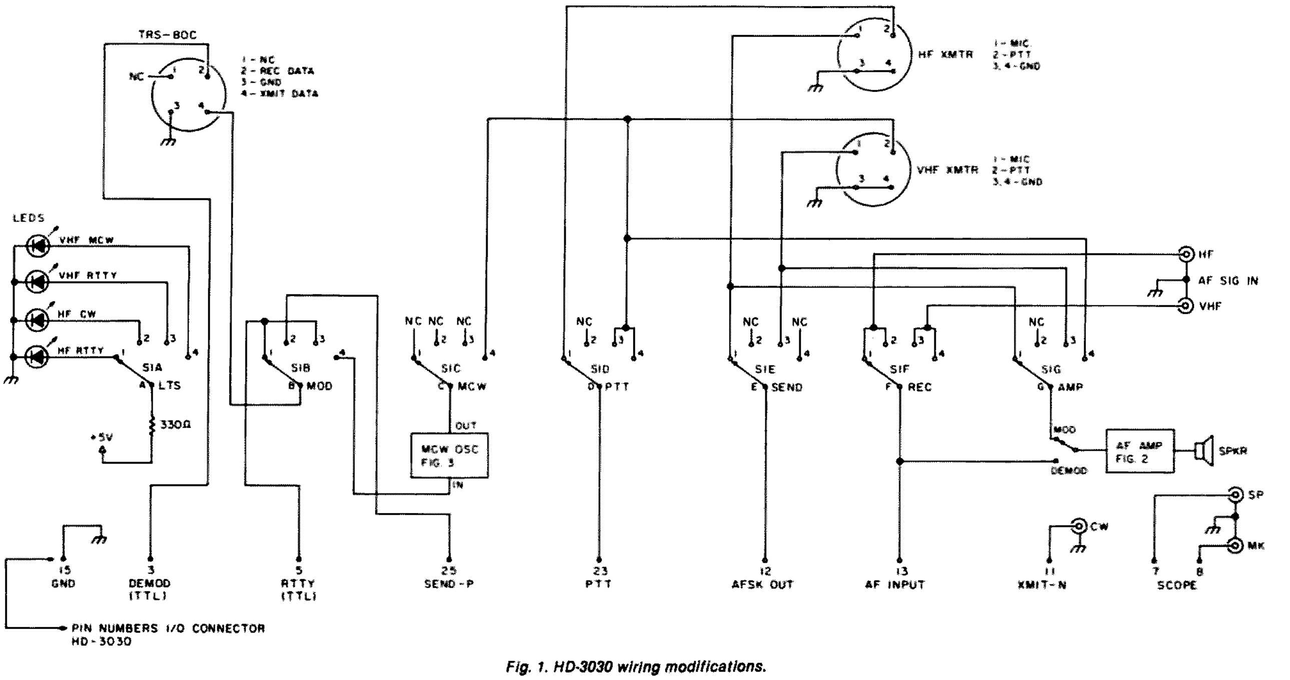

Fig. 1. HD-3030 wiring modifications.

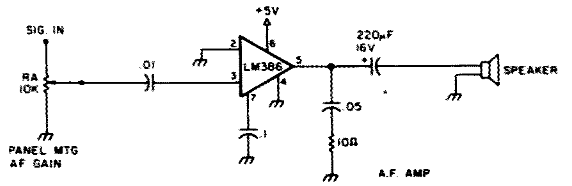

Fig. 2. This circuit adds an audio output to the HD-3030.

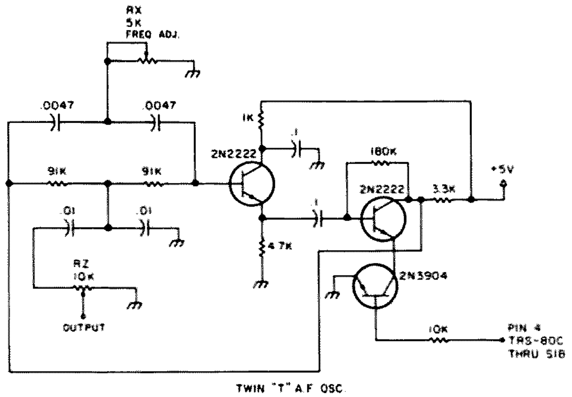

Fig. 3. A twin-T audio oscillator used to generate MCW.

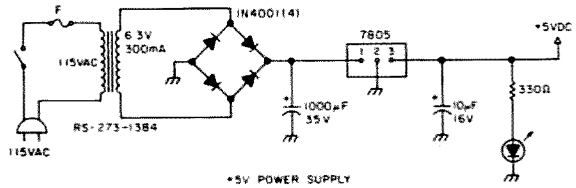

Fig. 4. An easily constructed 5-volt power supply.

cabling from floating rf, the wires between the HD-3030 and the interface box were all enclosed in a braided shield removed from an old coaxial cable. Fig. 1 shows the wiring of the main interface unit.

Several auxiliary boards were also constructed to add a few features here and there. Fig. 2 shows a small audio amplifier, based on the LM386 op amp, which is used to drive a small speaker with either the transmit or receive audio. Although the HD-3030 is able to receive modulated CW (MCW), it cannot generate this type of signal. Therefore, Jim used a classic circuit, the twin-T audio oscillator, to generate the audio waveform which the computer can turn on and off in order to transmit MCW. This circuit is shown in Fig. 3.

A rather conventional five-volt power supply runs the whole thing, and Jim's version is shown in Fig. 4. Except for the Centralab switch, all of the parts used in the interface are available from a variety of sources. The parts list gives a Radio Shack part number for all parts available there. Those few that are not carried at the Shack can be found in the Jameco catalog or on the wall of an independent electronics store. It would appear that even if you live in the middle of nowhere, you should be able to obtain the parts by mail order.

Jim drives the HD-3030 and his RTTY station with a program running on a TRS-80C. He did not specify which program he uses, but I would not doubt if it is Clay Abrams' NEWRTTY that we talked about earlier. Well, Jim, this looks like a very fine piece of work, and I am sure that the crowd appreciates your sharing it with us.

For those of you who have been looking for RTTY mailboxes, the coming months' "RTTY Loops" will be just the ticket. I have received quite a few listings and will put them all together for your enjoyment. I will also have the usual December shopping spree, a feature I know you enjoy by your comments. Also, the first four issues of "RTTY Loop" extracts remain available. Send $2.00 for each issue desired with a self-addressed, stamped envelope for each issue to the above address. If you would like a listing of what's available, just send the SASE. I especially appreciate all the nice comments I have been receiving lately, particularly those which say that when the new *73* arrives, the first place you turn is back here, to "RTTY Loop!"

SATELLITES

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Apogee predictions for the month of November are provided for three sections of the United States: Washington DC at 39N 77W, Kansas at 39N 95W, and California at 38N 122W. Times are in UTC and apogee in this case is mean anomaly 128 rounded to the nearest whole hour. Use the chart as a guide in aiming your antenna, then fine-tune the azimuth and elevation values to peak the satellite's beacon signal. If you require more accurate orbital predictions, contact AMSAT at PO Box 27, Washington DC 20044.

			WASH		KANSAS		CALIF	
ORBIT	DAY	TIME	AZ	EL	AZ	EL	AZ	EL
1374	1	2200	140	59	115	46	93	24
1376	2	2100	122	52	104	37	85	15
1378	3	2100	118	46	102	31	84	9
1380	4	2000	107	38	93	23	77	1
1381	5	0800					280	3
1382	5	1900	97	29	85	14		
1383	6	0700					274	13
1384	6	1900	95	23	84	8		
1385	7	0600			284	1	269	22
1386	7	1800	87	14	77	0		
1387	8	0600			279	4	263	26
1388	8	1700	80	6				
1389	9	0500	284	0	273	13	256	36
1390	9	1700	79	0				
1391	10	0400	278	8	267	23	247	46
1393	11	0400	273	11	261	26	238	48
1395	12	0300	267	21	253	36	223	57
1397	13	0200	260	31	244	45	202	63
1399	14	0200	253	34	235	48	188	62
1401	15	0100	244	43	220	56	161	62
1403	16	0000	231	52	198	62	137	57
1405	17	0000	221	54	185	60	132	57
1407	17	2300	201	60	160	60	117	44
1409	18	2200	175	62	138	56	105	36
1411	19	2200	164	59	132	50	104	30
1413	20	2100	141	55	117	43	95	21
1415	21	2000	124	49	106	34	87	12
1417	22	2000	121	43	104	28	86	6
1419	23	1900	109	35	95	20		
1420	24	0600					277	9
1421	24	1800	99	26	87	11		
1422	25	0600					272	12
1423	25	1700	91	17	80	3		
1424	26	0500			281	0	265	22
1425	26	1700	89	12				
1426	27				257	9	258	32
1427	27	1600	82	3				
1428	28	0400			270	12	252	34
1430	29	0300	275	7	264	22	242	44
1432	30	0200	269	17	256	32	229	53

SPECIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

ALBUQUERQUE NM
NOV 3

The UNM ARC and the Westside ARC will jointly sponsor a tailgate swapfest on November 3, 1984, from 10:00 am to 2:00 pm MST, on the UNM North Campus parking lot, corner of University Boulevard and Tucker Avenue, Albuquerque NM. Admission is free; bring your own tables as none will be furnished. Talk-in on 147.75/147.15 MHz and 449.3/444.3 repeaters. For further information, send an SASE to Gary Bonebrake K8BI, 974 Arkansas SE, Rio Rancho NM 87124, Robert Scupp WB5YYX, 648 Marquis Drive NE, Albuquerque NM 87123, or Jay Miller WA5WHN, 4613 Jupiter NW, Albuquerque NM 87107, or via 3.939 MHz, 0100 UTC daily.

SOUTH GREENSBURG PA
NOV 3

The Foothills ARC will hold its sixteenth annual hamfest on Saturday, November 3, 1984, at St. Bruno's Church, South Greensburg PA. Tickets are $2.00 each or 3 for $5.00; indoor flea-market tables are $5.00. Refreshments and food will be available. Talk-in on 147.78/.18. For further information, advance tickets, or tables, contact Ronald Naviglia WA3HOL, or write FARC, PO Box 236, Greensburg PA 15601.

SELLERSVILLE PA
NOV 4

The R. F. Hill Amateur Radio Club will hold its annual indoor Winterfest on Sunday, November 4, 1984, beginning at 8:00 am, at the Sellersville National Guard Armory (located approximately 5 miles from the Pennridge Airport, halfway between Philadelphia and Allentown, near the junction of PA Routes 309 and 563), Sellersville PA. Entry is $2.00 and non-ham spouse and children are admitted free when accompanied by a paying ham. Indoor spaces (6' × 6') are $6.00 each and outdoor spaces (1 parking-space-width frontage) are $4.00 each. The purchaser of vendor space will receive a single admission and must supply his own table. Food will be available on the premises and restaurants are nearby. Talk-in on 145.19(R), 148.88(R), and 146.52 (simplex). For vendor-space reservations, write PO Box 29, Colmar PA 18915, or phone (215)-721-0278 (call will be returned collect during the evening). Because there is no discount for advance purchase of entry, buyers are encouraged to purchase admission at the gate.

GRAYSLAKE IL
NOV 4

The Waukegan Civil Air Patrol will hold its 4th annual hamfest on Sunday, November 4, 1984, from 0700 to 1700, at Lake County Fairgrounds, Rtes. 45 and 120, Grayslake IL. Admission is $3.00 and tables are $5.00. For further information and reservations, send an SASE to CAP, 637 Emerald, Mundelein IL 60060.

TAYLOR MI
NOV 4

The RADAR eighth annual Swap and Shop will be held on November 4, 1984, from 8:00 am to 3:00 pm, at Kennedy High School in Taylor MI. Activities and forums are scheduled and free parking will be available. For more information, send an SASE to RADAR, Inc., PO Box 386, Taylor MI 48180, or call (313)-291-2298.

MONTVALE NJ
NOV 10

The Stateline Radio Club of New York and New Jersey will hold RadioExpo '84 on Saturday, November 10, 1984, beginning at 8:00 am, rain or shine, at Pascack Hills High School, Grand Avenue and Spring Valley Road, Montvale NJ. Take New York State Thruway south to the Schoolhouse Road exit, then south on Schoolhouse/Spring Valley Road; or take Garden State Parkway north to Exit 172, then east on Grand Avenue. Donations are $3.00 each (available only at gate). Tables are $10.00 by mail prior to October 31st and $13.00 at the gate; tailgaters' fees are $5.00 by mail prior to October 31st and $7.00 at the gate. Doors open for vendor setups at 6:00 am. Features will include FCC license exams through Extra class, DX films and forums, multimedia programs, a transceiver clinic (HTs checked free of charge), a food concession, and ample parking. Talk-in on 146.835 repeater and 146.565 simplex. For further information, contact Robert Greenquist, PO Box 325, Montvale NJ, or phone (201)-666-3902, day or evening.

WEST CONCORD MA
NOV 10

The 35th annual New England DXCC Dinner will be held on November 10, 1984, at the Concord Lodge of Elks, Baker Avenue, West Concord MA (near Routes 2 and 62). Activities will begin at 2:00 pm with a variety of DX talks and slide programs including video tapes of VU7WCY and XU1SS. The charge for the afternoon session is $2.00. The cocktail hour will be at 6:00 pm and at 7:30 pm, a seven-course, family-style roast beef dinner will be served. The banquet speaker will be Fred Laun K3ZO (ex-HS1ABD). The charge for the evening is $14.95. For more information, contact Steve Tolf K1ST, 12 Phylmor Drive, Westboro MA 01581.

WEST MONROE LA
NOV 10

The Twin City Hams will sponsor an all-indoor hamfest on Saturday, November 10, 1984, from 9:00 am to 3:00 pm, at the Convention Center, N. 7th Street, West Monroe LA. Features will include exams, swap tables, new-equipment dealers, and a ladies' program. Talk-in on 146.25/.85. For

✓ See List of Advertisers on page 88

more information, contact Benson Scott AE5V, 107 Contempo, West Monroe LA 71291.

NEWMARKET ONT CAN
NOV 10

The York Region ARC will present the 8th annual Newmarket Flea Market on Saturday, November 10, 1984, beginning at 0800, at the Newmarket Community Center, Civic Drive, Newmarket (just north of Toronto). Admission is $2.00 per person and children under 12 will be admitted free. Table rentals are $3.00 each plus general admission and will be held only until 0800 unless payment is made in advance (setup is at 0630). Refreshments will be available. For table reservations (include a check or money order made out to the York Region ARC) or more information, contact Geoffrey Smith VE3KCE, 7 Johnson Road, Aurora, Ont., Canada L4G 2A3, or phone (416)-727-6672 (evenings).

STONE MOUNTAIN GA
NOV 10-11

The Alford Memorial Radio Club will host the 12th annual Stone Mountain Famvention on November 10-11, 1984, at Stone Mountain Park, Stone Mountain GA. Hours on Saturday are 9:00 am to 5:00 pm and on Sunday, 9:00 am to 3:00 pm. Admission is $4.00, which includes admission for both days, parking at the hamfest site, and the Saturday-night cookout. Activities will take place at Lakeside Center, with inside dealer displays and light refreshments in the Hospitality Room. The Boneyard Mile will be just outside and a full-hookup campground is adjacent. Plans are at this time to give exams, Novice through Extra class, at the Stone Mountain Inn on Saturday and Sunday beginning at 8:30 am. Talk-in on 146.16/.76. For more information, write Jim Garner KE4BI, 490 Village Green Court, Lilburn GA 30247, or phone (404)-921-7588.

VETERANS DAY SPECIAL EVENT
NOV 10-11

The Armored Force Amateur Radio Nationwide Emergency Team (A FAR NET) will sponsor a Veterans Day activity for the amateur community on the weekend of November 10 and 11, 1984. Member stations will participate as special-event stations for the net. A special commemorative certificate will be available to all amateur stations that make contact with one member station. Net stations will operate on the Veterans Day weekend from 1200 GMT on Saturday, November 10, 1984, through 2400 GMT on Sunday, November 11, 1984. Primary frequencies will be as follows: 7285 kHz, 14,325 kHz, 21,375 kHz, and 28,640 kHz (plus or minus QRM). To obtain the certificate, send a QSL and a large SASE to the net's manager, Alfred G. Beutler, 36 Manchester Rd., East Aurora NY 14052.

NORTH HAVEN CT
NOV 11

The Southcentral Connecticut Amateur Radio Association (SCARA) will hold its 5th annual Electronics Show and Flea Market on Sunday, November 11, 1984, from 9:00 am to 3:00 pm, at the North Haven Recreation Center, Linsley Street, North Haven CT. Admission is $1.50 and children under 12 accompanied by an adult will be admitted free. Tables are $10.00 in advance for the main hall and $12.00 at the door. (Reservations are strongly advised.) Setup will be at 8:00 am, and for new-equipment vendors, a special exhibit area with setup security arrangements will be made available. There will be food both at the food booth and from a mobile cart. Features will include the latest in ham radio, computers, and electronics. Talk-in on 146.01/146.61 (W1GB). For more information, directions, and reservations (make checks payable to SCARA), send an SASE to Tony Vanacore AK1O, PO Box 81, North Haven CT 06473, or phone (203)-484-4175 (home) or (203)-239-5321, extension 311 (days).

FORT WAYNE IN
NOV 11

The Allen County Amateur Radio Society, Inc., will sponsor the 12th Fort Wayne Hamfest on Sunday, November 11, 1984, from 8:00 am to 4:00 pm, at the Allen County memorial Coliseum, Coliseum Boulevard (US 30) at Parnell Avenue. Tickets are $3.00 in advance and $3.50 at the door. Tables are $8.00 and premium tables are $20.00. Vendor setup is from 5:00 am to 7:00 am. No tables will be sold at the door, and the ticket- and table-reservation deadline is October 20th. Activities will include a large indoor flea market, commercial vendors, the Ham Band under the direction of Luke Matthew WB9EWJ, and all classes of radio exams (send Form 610 and an SASE to VE Coordinator, FWRC, PO Box 15127, Fort Wayne IN 46885, by October 26th). Talk-in on .88. For tickets, tables, or more information, contact Hamfest Chairman AC-ARTS, PO Box 10342, Fort Wayne IN 46851, or call Dave Smith KA9FFT at (219)-493-2439.

MASSILLON OH
NOV 11

The Massillon ARC will sponsor Auctionfest 84 on November 11, 1984, at the Massillon K of C Hall, off Route 21, Massillon Ohio, from 8:00 am to 5:00 pm. Sellers' setup is at 7:00 am. Admission is $2.50 in advance and $3.50 at the door. Tables are available at $7.00 per 8-foot space. Refreshments are available and there will be a sit-down dinner. There will be plenty of free parking. The auction starts at 11:00 am. Talk-in on W8NP, 147.78/.18. For advance registration or information, send an SASE to MARC, 920 Tremont Avenue SW, Massillon OH 44646.

PENANG, MALAYSIA
NOV 16-18

The Malaysian Amateur Radio Transmitters Society (MARTS) will host the 14th SEANET Convention on Friday, Saturday, and Sunday, November 16-18, 1984, at the Eastern and Oriental Hotel, Penang, Malaysia. Features will include symposiums, luncheons, tours, and rag-chewing. For more details, contact Malcolm Westwood, Organizing Secretary, SEANET, PO Box 13, Penang, West Malaysia.

BILLERICA MA
NOV 17

The Honeywell 1200 Radio Club and the Waltham Amateur Radio Association will hold their annual amateur-radio and electronics auction on Saturday, November 17, 1984, beginning at 10:00 am, at the Honeywell Plant, 300 Concord Road, Billerica MA (Exit 27 off Route 3). There will be a snack bar, a bargain parts store, and free admission and parking. Talk-in on 147.72/.12 and 146.04/.64 (club-sponsored repeaters). For more information, contact Doug Purdy N1BUB, 3 Visco Road, Burlington MA 01803.

PLYMOUTH MA
NOV 22

A special-event station (WA1NPO) from Plymouth, Massachusetts (America's Hometown) will be sponsored by the Whitman Amateur Radio Club and Plimoth Plantation on Thanksgiving Day, November 22, 1984. An attractive certificate suitable for framing will be issued to any foreign or domestic amateur who makes contact with this station, which will operate from 9:00 am until 3:00 pm. The station will be in operation at the Plimoth Plantation from an indoor site in the museum's 1627 Pilgrim Village.

Frequencies are as follows: 1300 to 1430 GMT—21.260 MHz; 1430 to 1730 GMT—7.280 MHz ± QRN and/or 7.050 MHz (CW); 1730 to 2000 GMT—21.385 MHz; 1300 to 1600 GMT—14.255 MHz or 14.180 MHz; 1400 to 1500 GMT—14.025 ± QRM; 1600 to 2000 GMT—14.345 MHz. There will be limited 2-meter operation on the local club repeater (tentative): 147.225/.835 and 146.52 simplex.

A UK club station is planning to participate: GB2UST (United States Thanksgiving) on 20m and 15m and GB4UST on 80m and 40m; they have some forty acres in which to erect antennas.

To receive a certificate, send proof of contact and $1.00 or four IRCs to the Whitman ARC, PO Box 48, Whitman MA 02382.

GREENSBORO NC
NOV 24-25

The 4th annual Greater Greensboro Hamfest will be held on November 24-25, 1984, from 9:00 am to 5:00 pm, at the National Guard Armory, 1100 Franklin Boulevard, Greensboro NC. For advance tickets, send an SASE to Fred Redmon N4GGD, 2305 Sherwood Street, Greensboro NC 27403. For dealers' space, tables, and flea-market information, contact Coy Hennis WD4NHL at (919)-294-2841.

OAK PARK MI
NOV 25

The Oak Park High School Electronics Club will hold its 15th annual Swap 'N' Shop on Thanksgiving Sunday, November 25, 1984, from 8:00 am to 4:00 pm, at the Oak Park High School, Oak Park MI. The doors will open at 6:00 am. Admission is $2.00 and 8-foot tables are $6.00. Refreshments will be available. For more information, send an SASE to Herman Gardner, Oak Park High School, 13701 Oak Park Boulevard, Oak Park MI 48237, or phone (313)-968-2675.

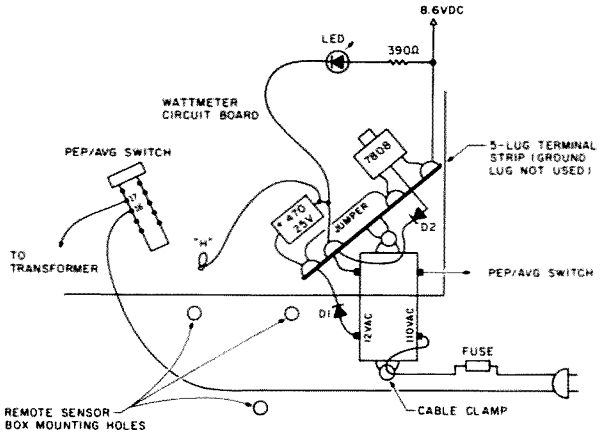
STONY BROOK NY
NOV 25

The Radio Central ARC will present the 6th annual ARRL Ham-Central on Sunday, November 25, 1984, from 9:00 am to 3:00 pm, in the social hall of Temple Isaiah, 1404 Stony Brook Road, Stony Brook, Long Island NY. General admission is $3.00 and children under 12 and XYLs will be admitted free. An 8-foot table space is $7.00 and includes one free admission. Doors will open at 7:30 am for dealers and sellers (ham-related items only). There will be food, drinks, and free parking available. Seminars will feature speakers Gerry Hull VE1RM/W1 on the St. Paul Island DXpedition of 1983, Paul Beeman KA2MUM with an OSCAR lecture and slide show, and Art Greenberg W2LH and Madeline Greenberg W2EEO with an antenna lecture. Talk-in on 144.550/145.150 and 146.52. For reservations and more information, contact Bob Yarmus K2RGZ, 3 Haven Court, Lake Grove NY 11755, or phone (516)-981-2709 Monday through Friday after 6:00 pm.

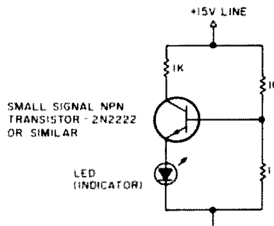
CIRCUITS

Do you have a technique, modification, or easy-to-duplicate circuit that your fellow readers might be interested in? If so, send us a concise description of it (under two pages, double-spaced) and include a clear diagram or schematic if needed.

In exchange for these technical gems, 73 offers you a one-year subscription (or extension), to be sent upon publication. Submit your idea to: Circuits, Editorial Offices, 73 Magazine, Peterborough NH 03458. Submissions not selected for publication will be returned if an SASE is enclosed.

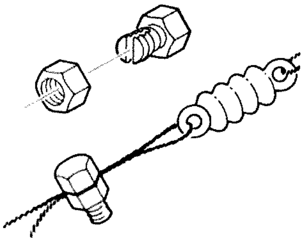


SELF-CONTAINED BATTERY ELIMINATOR FOR THE HEATH HM-2140: This simple circuit is built into the wattmeter cabinet and doesn't interfere with the internal mounting of the remote sensor box. The PEP/AVG push-button switch has an extra set of contacts which can be used to switch the power supply on when PEP readings are desired. The LED is centered between the meters on the front panel. The fuse holder can be an inline type or be mounted on the circuit board behind the battery clip. Note that the negative side of the power supply does not go to ground. If you don't plan portable battery operation in the future, the 8.6-V output can be permanently wired to lug 2 of the PEP/AVG switch. The transformer is mounted between the existing screw near the battery clip and a spacer installed on the bottom cabinet. A five-lug terminal strip mounted with the transformer at the corner of the circuit board will hold the other components, and a cable clamp on the other side of the transformer secures the line cord. If a type 7808 three-terminal regulator is not readily available, an LM317T adjustable regulator (Radio Shack #276-1778) can be substituted.—Wayne Arnett AI7C, Chandler AZ.

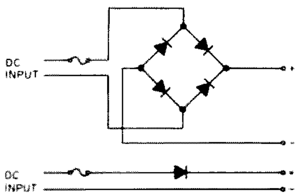


CIRCUIT FOR "SMART PANEL LAMP" AS DESIGNED FOR REGULATED 15V LINE

SMART PANEL LAMP: This power-on indicator for your regulated 15-V supply also indicates overload conditions (current-induced voltage drop) and can be easily modified for other voltage levels. Two resistors sample the output voltage and compare it with the 2.2-V reference defined by the LED and transistor emitter-base-junction voltage drop. If the regulated 15-V line drops by about a volt, the indicator LED goes out. The 1k resistor in the collector circuit limits the current draw to 15 mA so the indicator won't burden the supply.—Penn Clower W1BG, Andover MA.



INVERTED-V TUNING TRICK: Tuning the inverted-V antenna requires adjustment of both the enclosed angle and the length of each side of the dipole. You can take the pain out of length adjustments by fastening the ends to the insulators with split bolts. These come in various sizes, and I recommend using the kind made from bronze.—Wm. Bruce Cameron WA4UZM, Temple Terrace FL.



POLARITY PROTECTION FOR PLUG-IN RADIOS OR OTHER SOLID-STATE DEVICES: By adding a diode or a diode bridge in the dc power-input circuit, you can have complete protection against ever connecting the unit backwards. With the bridge circuit, it makes no difference which way the connection is made. However, if the diode is connected in reverse, there will be no current to the unit due to blocking action of the diode. When connected correctly, diode will conduct and the unit will work. Using this with plug-in radios, mount the bridge or diode inside the chassis. Be sure the bridge or diode will handle the maximum current requirement.—E. A. Rowe W7PWQ, Chelan WA.

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½" × 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye," and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

About three years ago I built a CMOS digital thermometer out of *Popular Science* magazine. The probe uses a Texas Instruments 6.8k Tm-1/4 sensistor with a positive temperature coefficient. I haven't been able to find this part—can anyone help?

David Shoal WD4CZW
Rt. 5 Box 375
Mocksville NC 27028

Just a note to some of the readers concerning "Ham Help." If someone sends you the information you need, please send an acknowledgement back to that person, perhaps including the postage. After all, he or she went out of the way to find and copy the material for you.

I don't know how many people respond to these requests for help, but in April I mailed 78 pages of information to 7 different hams. Only one person, a teacher, returned a note of thanks. In January it was 5 sets of information—with no replies.

I'll still send the stuff out, but I wonder what happened to the spirit of amateur radio?

J.Y. Lem KB6BO
5222 Coringa Drive
Los Angeles CA 90042

Has anyone been successful in converting a Swan 500C to a 500CX? I also would like to increase the stability of the 500C, and to overcome its transmit-to-receive problem.

John Matthews K6VS
12206 Huston Street
North Hollywood CA 91607

I will pay for any data concerning the Nems Clarke UHF receiver model 2801A.

John Elmquist
3308 Bahama N.E.
Albuquerque NM 87111

I am interested in obtaining a National NCX-1000 or NCX-2000, used or reconditioned. Write with price and condition via airmail to:

Fermin Anzalaz LU1SH
PO Box 155
5300 La Rioja
Argentina, South America

I need manuals for a Lavoi spectrum analyzer LA-17 and a DEI telemetry-receiver tuning unit T-102-A (216-260 MHz). Will pay reasonable costs incurred.

Paul Veltman WA6QKQ
5333 York Drive
Fremont CA 94536

Would someone please help me find a schematic or manual for a Communications Power, Inc., model WM-1000 wattmeter? I will gladly pay for any costs incurred.

Richard Whipkey AD6X
888 Yolo Way
Livermore CA 94550

NEW PRODUCTS

JENSEN OFFERS FREE CATALOG

A new catalog of precision tools is offered free by Jensen Tools, Inc. Illustrated in full color, the 160-page catalog contains more than 3,000 tools of interest to field engineers, technicians, computer- and telecommunication-service persons, and electronic hobbyists.

Major categories covered are test equipment, soldering equipment, tweezers, screwdrivers, cutters, drafting supplies, power tools, computer accessories, circuit-board equipment, and miscellany. Also included are many new products from Jensen and over 40 pages of service kits and tool cases for electronic specialists and technicians.

To obtain a free copy, write *Jensen Tools, Inc., 7815 S. 46th Street, Phoenix AZ 85040; (602)-968-6231.* Reader Service number 482.

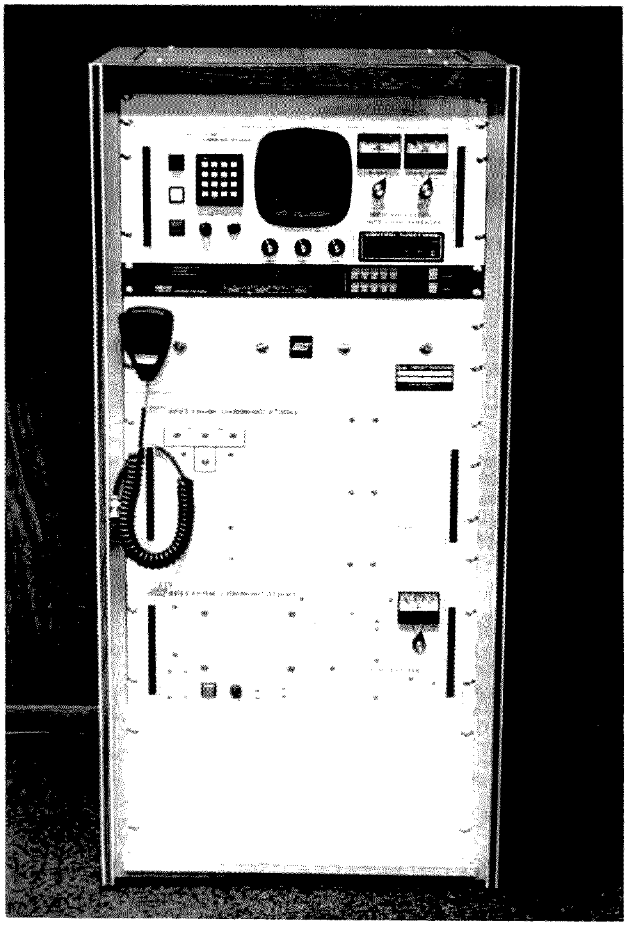
SPECTRUM COMMUNICATIONS' SCR2000X REPEATER

Spectrum Communications' SCR2000X microprocessor-controlled repeater combines the latest digital techniques with Spectrum's highly-refined rf technology to yield an advanced, high-performance repeater system.

Standard features include: full autopatch and touchtone™ remote-control capability, phone-line and over-the-air command modes, up to 13 auto-dial telephone numbers, a touchtone-to-pulse converter, full 16-digit decoding, up to 6 auxiliary functions, automatic CW identification, and built-in battery backup for the microprocessor's memory in case of a power failure.

Several power levels are available from 30 to 75 Watts on 144, 220, and 440 MHz. High-power rack-mount repeater power amps and power supplies are available up to 150 Watts.

For more details, contact *Spectrum Communications Corp., 1055 W. Germantown Pk., Norristown PA 19401-9616; (215)-631-1710.* Reader Service number 478.



Spectrum Communications' SCR2000X repeater.

DOCTOR DX BY AEA

Doctor DX by AEA is a complete CW contest simulator packaged in a plug-in cartridge for the Commodore 64. It is a computer simulation of the *CQWW DX* Contest, allowing you to work the HF bands using a computer-generated modern-style transceiver and omnidirectional antenna.

All of the stations you will work using Doctor DX are generated by the computer. As you tune up and down a particular band, you will hear stations contacting other stations, plus QRM and QRN, similar to on-the-air conditions. Station prefixes are generated according to international callsign-allocation conventions, and are weighted according to amateur-operator density. The speed of the stations at the lower end of the bands is much faster than that of stations higher up, and the low-end operators have greater "savvy."

AEA's Doctor DX contest simulator.

The propagation programmed for each band is driven by a real-time clock, with conditions varying by the time of day and band selected. Band conditions are simulated for a sunspot-cycle peak for a station using an omnidirectional antenna.

A typical two-way contact involves exchanging callsigns, signal reports, and CQWW zones. If you miss part of a report, you may ask for and receive a repeat. If you make an error, the simulated station will request a repeat. You may also request the other station to QRS or QRO.

Doctor DX approaches reality in its operation. AEA even offers award certificates to operators who work all zones, DXCC, 5-band DXCC, or qualify for the Doctor DX Honor Roll.

For detailed information on Doctor DX, contact *Advanced Electronic Applications, Inc., PO Box C-2160, Lynnwood WA 98036; (206)-775-7373.*

OMNITRONIX RS-232 INTERFACE

Omnitronix has announced the release of their Deluxe RS-232 Interface for the VIC-20, C64, and SX64. The RS-232 interface has been designed to allow easy use of any type of RS-232 equipment, including serial printers and modems. The interface plugs into the user I/O port of the computer.

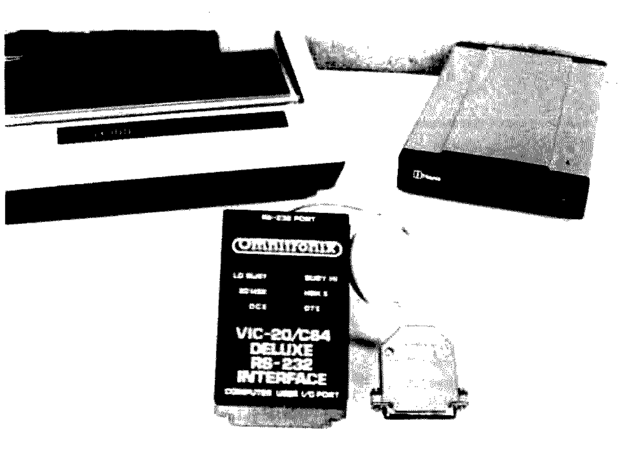
Included as part of the unit is a three-foot cable terminating in a male or female DB-25 connector. The Deluxe RS-232 Interface can also be supplied with a PC-board-mounting female DB-25, allowing it to replace the 1011A. Three switches in the case cover allow you to set the unit for DTE/DCE, invert pins 20 and 5, and select the Busy line polarity. The RS-232 interface supports virtually all RS-232 signals including Ring Detect and can operate at up to 2400 baud. The manual includes a type-in Basic terminal program and a tutorial on using the RS-232 port.

For additional information, call or write *Omnitronix, PO Box 43, Mercer Island WA 98040; (206)-236-2983.* Reader Service number 480.

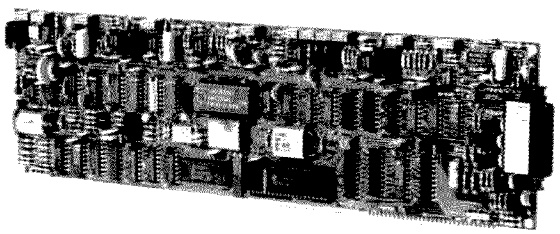
HAL'S IBM/RTTY INTERFACE

HAL Communications Corporation is offering their new PCI-2000 RTTY Interface module for the IBM-PC™. Features include full Bell 103/202 support, 170/425/850-Hz shift, direct FSK output, 45–1200-baud transmission rate, and Morse, Baudot, or ASCII codes.

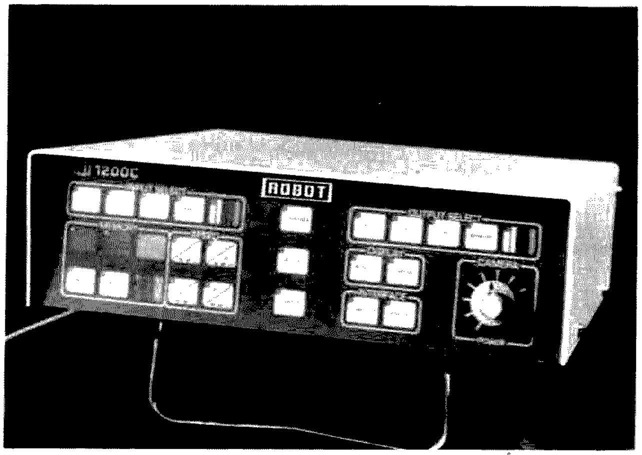
The supporting software incorporates such features as split-screen formatting, transmit and receive buffering, and disk-file storage and retrieval. All PCI-2000 parameters are set using the PC's FN keys.



Commodore RS-232 interface from Omnitronix.



HAL's IBM-PC RTTY/CW interface.



The Robot 1200C color SSTV converter.

For further information, contact *HAL Communications Corporation, PO Box 365, Urbana IL 61801; (217)-367-7373.* Reader Service number 484.

HI-RES COLOR SSTV CONVERTER FROM ROBOT

A new high-resolution color SSTV converter has been added to Robot's line of amateur-radio products. Designated the Model 1200C, it is capable of transmitting color video images that rival broadcast television in picture quality. The Model 1200C has three selectable 6-bit memory planes that combine to form 262,144 color combinations in a 256 × 240 line full-screen display.

Eight different black-and-white- and color-transmission formats are available with automatic selection on receive. Up to six separate pictures may be stored in memory. The unit accepts color or black-and-white composite video from standard TV cameras and has RGB, composite, or rf-modulated video output.

A unique feature of the Model 1200C is the 8-bit parallel I/O port for computer interfacing. This allows total access to each individual pixel by a host computer for image processing, transformation, storage and recall, and graphics. This port also allows connection to a printer for black-and-white or color hard-copy picture printing.

The Model 1200C features touch-sensitive front-panel switches for full station control and several automatic functions. Fine tuning, speed switching, and color or black-and-white detection are automatically accomplished without operator intervention.

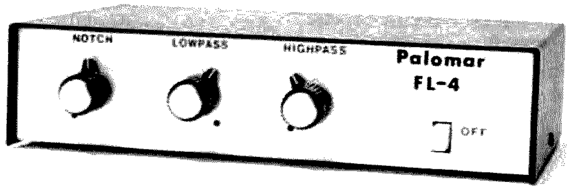
For further information, contact *Robot Research, Inc., 7591 Convoy Ct., San Diego CA 92111; (619)-279-9430.* Reader Service number 479.

UNIVERSAL AUDIO FILTER FROM PALOMAR

Palomar Engineers has announced a new universal audio filter. Model FL-4 is for SSB/CW/RTTY and features switched-capacitor filters. A 10-pole low-pass and an 8-pole high-pass can be moved anywhere in the 200-3500-Hz range to form a sharp bandpass filter at any frequency and of any bandwidth. A notch filter is also included.

The filter connects to the receiver's phone jack and provides 2 Watts of audio to drive a speaker. The on-off switch bypasses the filter when not in use. It operates from 15 V dc.

For further information, contact *Palomar Engineers, Box 455, Escondido CA 92025.*



The Palomar FL-4 Universal Audio Filter.

SIMPSON PANEL METER CATALOG

Simpson Electric Company is offering a new four-color catalog, number 5400-P. The catalog lists the entire Simpson line of over 1500 US-made analog and digital panel meters, meter relays, and controllers. Also listed are panel-mount chart recorders.

Simpson, manufacturer of the world-famous 260® VOM, is a member of the Katy Industries, Inc., Electrical Equipment and Products Group. For a free copy of Simpson Catalog 5400-P, write to *Simpson Electric Company, 853 Dundee Avenue, Elgin IL 60120-3090; (312)-697-2260.* Reader Service number 483.

ISS HALON EXTINGUISHERS

International Safety Systems, Inc., (ISS) has announced two fire-fighting products designed specifically for consumers, using Halon, a colorless, odorless, electrically nonconductive vapor.

Halon chemically interferes with the combustion process by breaking up its complex chemical reactions, while other extinguishing agents only smother the fire. It is extremely low in toxicity, does not damage property, leaves no residue, and has a twelve-year shelf life.

ISS's Halon products consist of two models; the 12-C and the 24-H, containing .75 lbs and 1.5 lbs of Halon, respectively. The smaller 12-C is ideal for placement in an auto glove compartment or in a kitchen. The 24-H is excellent for a light aircraft, camper, or workshop.

For further details, contact *ISS, 2227 Idlewood Rd., Suite 4, Tucker GA 30084.* Reader Service number 485.

REVIEW

BREAK COMMUNICATIONS SYSTEMS EQUIPMENT CONSOLE

Amateur equipment comes in all shapes, sizes, and levels of complexity. But whether you're using the latest solid-state marvel or a venerable old "boat anchor," one piece of gear is an absolute necessity: some sort of operating table or console.

After years of operating from various tables with mixed results, I recently took the plunge and acquired an equipment console from Break Communications Systems (BCS), Inc. It not only provides a convenient and rugged operating position, it's also a superb-looking piece of furniture.

Description

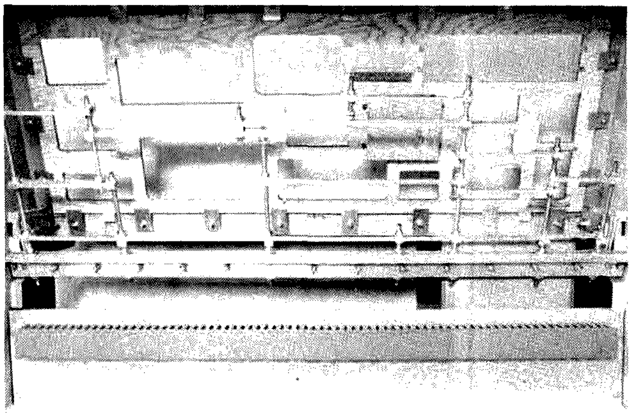
As the photos show, the BCS console consists of a desk top or writing surface and a gently sloped front panel with cutouts to allow the front of each piece of equipment to protrude through. Behind the front panel is an aluminum and steel support rigging that carries most of the weight of the gear. The holes in the front panel are cut by a computer-driven saw to fit precisely around the equipment with little or no "slop." The front panel is attached to the console with a number of heavy steel clamps, allowing replacement of the panel when new equipment is acquired.

The console is constructed of hardwood, 1/2" and 3/4" plywood, and 1/2" particle board. BCS consoles are covered in a high-pressure laminate (the generic name for materials such as Formica). Standard consoles are four, six, or eight feet wide and weigh from 150 to 350 pounds without radio gear. Many accessories and options are also available, as are L- and U-shaped consoles.

Designing The Console

No two hams have the same radio gear or operating habits. Therefore, the ideal operating console should be customized for every ham. The key to customization in the BCS design is the front panel, which is cut to accept the equipment in any arrangement desired by the customer. BCS has developed some interesting techniques that allow the creation of front panels with precisely-cut equipment holes without the need to actually lay their hands on the gear. Getting the console exactly right becomes a cooperative effort between BCS and each customer.

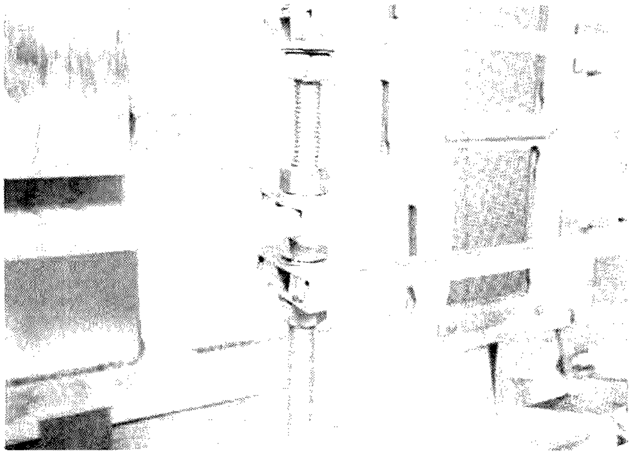
Once the basic size of the console is selected (for my equipment, a six-footer was just right), then begins the process of determining the exact size and shape of each hole BCS will cut in the front panel. It starts with BCS sending the customer a basic measuring kit and wooden templates or "test cuts" for any of the gear for which BCS has previously cut front-panel holes. The customer must carefully measure any equipment BCS has not dealt with before. Also, each template must be carefully checked to see that it fits per-



Rear view of BCS console, showing the equipment support rigging, the cutouts in the front panel for radio gear, and the steel clamps (around the perimeter) which hold the front panel in place.

fectly around the front of its respective gear. It turns out that manufacturing tolerances allow for considerable variation in the dimensions of rigs of the same model, so BCS gives customers a special form on which to indicate how each template must be modified for a perfect fit.

All measurements and template modification instructions are phoned or mailed to BCS, which then sends out a complete new set of wooden templates for any rigs that weren't perfect the first time. This sequence of template modification followed by new templates continues until the customer has a template that fits each piece of gear as precisely as possible, the goal being no more than 0.03" of slop.



Closeup of a portion of the steel and aluminum support rigging. The vertical members are 1/2-inch threaded rod.

The arrangement of the equipment on the front panel is what makes the difference between a station that is easy and efficient to operate and one that is (literally) a pain in the neck. A poorly-planned layout can have the operator forever straining to reach an often-used accessory. For its part, BCS sends each customer a one-half-scale mock-up of the front panel, along with one-half-size cardboard cutouts (called "puppets") in the proper shape of each piece of equipment. It is then up to the customer to move the puppets around the front-panel mock-up until the best layout is found.

Once the templates fit properly, the front panel is laid out, all options are specified, and the color scheme is selected (not easy—there are thousands of choices!), then the console can be prepared and shipped in about two weeks. Total elapsed time from the start of the design process is six to eight weeks. It took a bit longer in my case, but only because I didn't respond as quickly as I might have when new templates were shipped to me. Total time invested on my part was less than three hours.

Performance

The BCS console is worth waiting for. Overkill is the only word to describe the protective shipping crate in which my console arrived. I've never seen sturdier packaging. Assembly was a snap, even for one person, and can easily be accomplished in an afternoon. The only tools required are 9/16" and 3/4" open-end wrenches, although a socket wrench makes the job much easier. I encountered no problems whatever.

Mounting the equipment is equally undramatic. The rugged metal support rigging was set up at the factory for my equipment layout and worked exactly as advertised—very solid. Minor adjustments were made to square up each piece of gear with the front panel, and I found it convenient to remove the rubber feet from some pieces. The console can be rolled about easily on its heavy-duty casters and the back is open, allowing access to the rear panels of all gear. There is also plenty of room in the rear of the console for accessories such as power supplies, VHF amplifiers, and other items not requiring front-panel space. An optional drawer/bookshelf unit provides a handy place to store things like logbooks, message forms, and spare fuses.

Conclusions

There are pluses and minuses to this type of operating console. On the plus side, there is the complete absence of unsightly wires and cabling, having all equipment within easy reach (yet not piled on top of itself), the convenient access to the rigs from behind, and the knowledge that if I ever buy new equipment, I need replace only the front panel and support rigging for a relatively small fee. Equally important, perhaps, is the feeling of pride one gets in operating from such an impressive looking console. It's like having a seat at mission control.

On the other hand, a ham who replaces his gear frequently, or who likes to rearrange his operating position once a month, may find it prohibitive to replace front panels so often. For my purchasing patterns and operating style, it presents no problem, as it is usually two or three years between major changes at WB8BTH.

In summary, I couldn't be more pleased with my BCS console. The workmanship is first rate, and the console is built like a tank. Larry Kushner WA6BKC/4 and his crew have done a fine job.

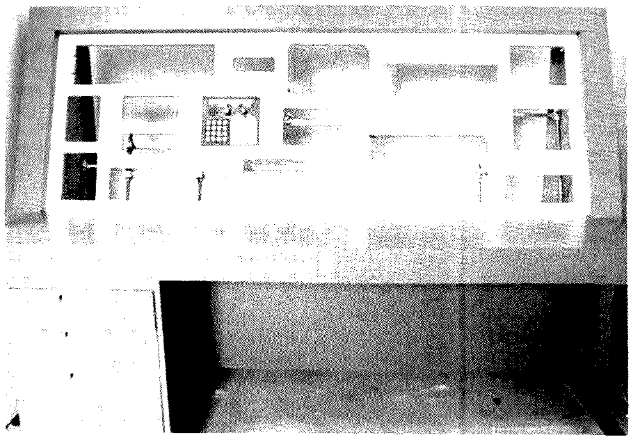
Prices for BCS consoles start at $600. For more information, write *Break Communications Systems, Inc., 5817 SW 21st Street, Hollywood FL 33023.* Reader Service number 486.

Jeff DeTray WB8BTH
73 Staff

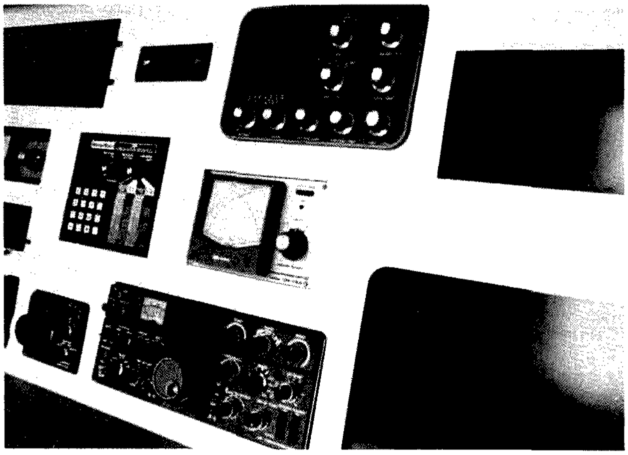
MIZUHO MINIATURE SIX-METER MULTIMODE

A couple of years ago at the Dayton Hamvention, I saw a little Japanese transceiver kit for sale. It was about the size and shape of an ICOM 2A, but it wasn't an FM rig. It was a *sideband* handie-talkie with only a quarter-Watt output; the Mizuho MX-6Z. Amusing, I thought, but not really serious. It turned up again in 1983 at Dayton and began to be advertised in the ham magazines. Three models were now available, covering 15, 6 and 2 meters, plus amplifiers for the 15- and 6-meter units and some accessories. So they *were* serious after all! Curious about what sort of rig it could be, I bought a pair of the six-meter versions. (A pair, to ensure someone to talk to. I wasn't sure what sort of 6-meter activity there was here in eastern Tennessee).

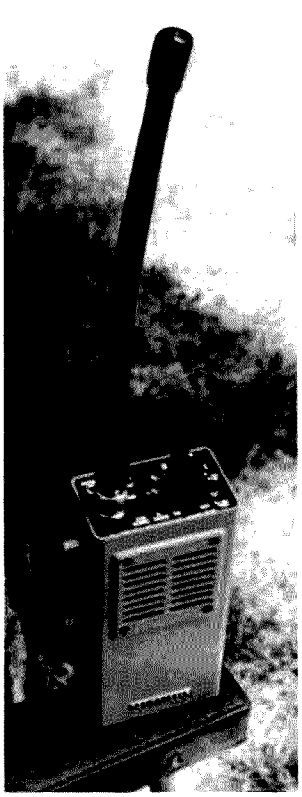
Assembling the kits turned out to be quite simple, taking only about 45 minutes each, despite some missing steps in the English-language instructions. The full Japanese instruction set was included too, with enough drawings to make up



The completed BCS console, ready to receive the station equipment. My keyer, an unusually-shaped piece of gear, is already in place, having been custom-mounted for me at the factory.



Only the faceplate of each piece of gear protrudes through the front panel, giving the console a sophisticated look.



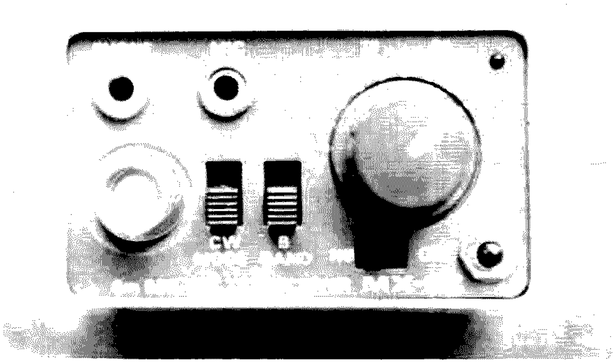
The Mizuho MX-6Z.

for the missing info. There were also some suggested modifications in the Japanese instructions, such as an S-meter (though I don't know where you'd mount it!), a transmit light, and a CW sidetone, which aren't in the English version. The two circuit boards were already assembled, tested, and mounted, leaving only a little wiring and case assembly to do. Two types of battery holder were provided; a 9-volt transistor-battery connector, and a holder for six AAA cells. I recommend the latter, since the unit draws enough current to deplete almost any 9-volt transistor battery in short order.

Both units worked as soon as power was applied, and no tune-up was necessary (no instructions were provided anyway). Initial tests with bench supplies showed a need for a little more bypassing at the external-power input jack on the bottom of the case since the supplied external-power cord was radiating more than my dummy load! A .001-uF ceramic across the dc-input terminals quieted things down. One unit put .275 Watts into the load on CW and SSB voice peaks, the other a little less. However, both drew 220 mA from the 9-V supply while doing it. Current drain on receive is about 40 mA, and 100 mA during key-up transmit. A regular carbon-zinc transistor battery went flat very quickly under the strain, so I switched to alkaline AAA cells which have held up pretty well in light usage. A separate power supply or external battery pack is really necessary for any serious long-term operating. It looks to me as if a battery pack from an ICOM 2A would fit perfectly on the bottom of the case if it could be attached securely.

Initial tests in the field (literally a field!) showed that the little units have good audio quality and frequency stability on both transmit and receive. The 11-inch "super rubber ducky" antennas supplied gave perfect copy at a range of a half mile with a hill and building in between. The tuning knob is on the top of the case and controls a variable crystal oscillator with a range of 50 kHz. A "band" switch next to it switches between either of two crystals (one is provided, for 50.2 to 50.25 MHz), giving it a total of 100 kHz of coverage. The necessity of tuning in the other station and the lack of squelch are a little strange at first when your only other hand-held experience is with 2-meter FM. Perfectly normal on HF sideband, but unexpected in a handle. The transmit button isn't a push-to-talk type. It's a latching switch—push once to transmit, again to receive. Since the MX-6Z also transmits CW (from a tiny button on the top panel or through a miniature jack on the bottom), this does make some sense. The internal microphone is an electret type, and there is an external-mike jack on top of the case next to the headphone jack. A noise-blanker switch is below the tuning knob, and the blanker does seem to work pretty well on ignition noise, an important consideration on six meters.

As you'd expect in any unit that packs this many features into so small a case, the circuitry is pretty simple. One of the two PC boards is devoted to rf, and the other to i-f, sideband generation, and audio. The receiver is a single-conversion type with a fixed-tuned dual-gate MOSFET rf-amplifier stage. I measured the sensitivity (crudely) as about 0.8 uV for 20-dB signal-to-noise; I could hear a signal at 0.1 uV. The i-f frequency is 7.8 MHz, and the tiny crystal filter seems adequate on both receive and transmit. A quick and dirty check showed a 6-dB bandwidth of about 2 kHz, from rf in to speaker out. The transmitter has three "power amplifier" stages following the transmit mixer, the first of which is a dual-gate MOSFET which is keyed for CW. All of the stages are broadly tuned and inductively coupled except the final, which is a multi-stage pi type. Transmit-receive switching is done with diodes and is accomplished with a closure to ground, so CW break-in operation might be possible with a simple modification. Audio output and quality is pretty much on a par with other handie-talkies, with an LM386 audio-amp IC driving a two-inch speaker.



Mizuho MX-6Z controls.

The best part of this little rig is that it's fun! It really works pretty well for its low power. When six is open, not much power is needed, of course, and when the band is closed, not much will help. One of the first contacts I made after building and testing my MX-6 was with a south Texas station, followed by contacts with Oklahoma and Minnesota, all between 800 and 1000 miles from my Tennessee OTH. This was done with an 80-meter dipole, since I didn't have a six-meter antenna up! A proper antenna and more power would help a lot. QRO is available in the form of a 5-Watt amplifier, the PL-6.

Ultimately, this litle rig is likely to be used for portable or mobile work such as mountaintopping. Its small tuning knob and limited tuning range, to say nothing of its low power, will not make it a favorite of hard-core six-meter operators, but it is a nice cheap way to get on six-meter sideband. I use mine mostly for local monitoring and checking for band openings, tasks for which the rubber-ducky antenna works fine. When activity occurs I can hurry to the shack and plug in the outside antenna and sharpen up my QRP operating skills. One of these days I'm going to get a portable six-meter beam and hike up into the Smokey Mountains and hope for a band opening. Then the MX-6 will really be in its element!

For further information, contact *Ace Communications, 2832-D Walnut Ave., Tustin CA 92680; (714)-544-8281.* Reader Service number 477.

Mark Nelson AJ2X
Knoxville TN

YAESU FT-726R

Remember the advertising bit about "Who put eight great tomatoes in that little bitty can?" I think I know who did it, and they now work for Yaesu! The features packed into Yaesu's FT-726R go beyond those of the early all-mode rigs to create a truly impressive radio. A glance at the front panel finds controls usually associated with an advanced HF rig rather than a VHF one. One's choice of options centers largely around band preferences rather than operating modes or signal processing. More about that in a moment.

The FT-726R comes with 2 meters as standard equipment, with provisions for installing two optional modules for other bands. Available modules include those for HF (15, 12, 11, or 10 meters), 6 meters, and 70 cm (430–440 MHz or 440–450 MHz), with thinly veiled rumors of forthcoming 220- and 1296-MHz modules. The optional satellite module permits full-duplex crossband operation via OSCAR or RS satellites. Operation on LSB, USB, CW, and FM is standard. No optional speech processor or noise blanker here; both are standard. As in most digitally-tuned rigs, there are two vfos plus memories, along with scanning features. A microprocessor keeps track of the mode of operation and controls the memory and scanning functions. Receiver performance is enhanced by controls for agc time constant, i-f shift, i-f width, rf gain, audio tone, and clarifier (RIT). Provision is made for installation of a CW filter.

Impressions

The review unit was equipped for the satellite enthusiast and casual operator on 2 meters and 70 cm. Modules for 2 meters, HF, and 70 cm were installed, along with the satellite unit and a 300-Hz CW filter (model YK-455.8MCN). Even after operating a variety of gear over the years, my initial reaction to the front panel was one of mild panic—how could I master all those (41!) controls? A look at the rear panel, though, found it surprisingly "clean" with jacks for key, 600-Ohm audio output, external speaker, external push-to-talk, and power. Each module has two rear-panel jacks: the separate coaxial connectors that allow bandswitching without swapping cables, and companion 3.5-mm jacks which provide ground-on-transmit to energize an external amplifier on the appropriate band. It was reassuring to find a type-N coax fitting on the 70-cm module.

It didn't take long to find room for the 726—it can replace *six* boxes in my shack! A closer look at the front panel and perusal of the operating manual showed that the controls are logically grouped, and later operating bore that out. Don't think you can make this radio do all its tricks without looking at the manual, though.

A word on the manual itself is in order here. It is definitely an *operating* manual. There is no theory of operation or detailed parts layout. Complete installation and operating instructions, schematics, and block diagrams are included, as well as procedures for installation of options. The only fault I could find with the manual turned up when I tried to operate through OSCAR 10 and the 726 seemed to get "confused." It turns out that when operating crossband full-duplex, the uplink and downlink modules must both be in CW or both be in SSB. A LSB/USB mix works; a CW/SSB combination does not. The manual isn't too clear on this.

OSCAR 10 operation was good when using a 16-element linear yagi on 435 MHz and my four-yagi EME array with tower-mounted preamp on the downlink. A later attempt on Field Day was not so successful when using the same uplink antenna and a 10-element "twist" downlink antenna with no preamp. Reasonable performance could probably be expected with circular polarization on uplink and a downlink system between the extremes tried here.

Moonbounce operation proved the worth of the i-f-shift and width controls and the 20-Hz clarifier steps in enhancing weak-signal readability. The results were so dramatic that I didn't even try the outboard audio filter I usually use. Semi-break-in CW is smooth at about 18 wpm, but the delay is too short for the slower speeds used on EME—the extent PTT could be wired with a toggle switch to get around this. Incidentally, it appears that a variable resistor (VR07 on the tx unit) controls break-in delay, but it isn't mentioned anywhere. (Nor is VR08, which controls sidetone volume. *Operating* manual, remember?).

The 726 was pressed into service on 70 cm during contest operation from a hilltop near Ithaca NY. Intermod problems from an FM station 2 miles away on the next hill disappeared when we substituted the FT-726R for our usual 432 rig. Receiver sensitivity seemed good and the transmitter drove a solid-state amplifier nicely. The other operators in our multi-op effort mastered the rig's essential controls quickly and easily.

Assorted Pluses and Minuses

The CW filter has its own front-panel

control and that's great! Hats off to the engineer who gave the filter in/out choice to the operator and made clockwise rotation of the tuning knob increase frequency. On the negative side, I found the CW sidetone clicky to the point of being slightly annoying, especially in headphones. A few spurious signals turned up in the HF region even when the antenna was replaced with a good 50-Ohm load. The spurs didn't show up on 2 meters or 70 cm. Power-line noise had to exceed S3 on the S-meter before the blanker had an effect. Suprisingly, the blanker could do nothing with ignition noise from my neighbor's lawn mower. It's obvious that noise rise time and level both determine how effective the blanker will be.

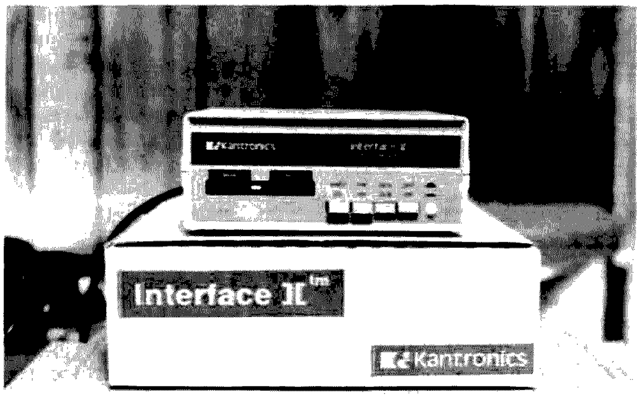
The Bottom Line

Overall, the FT-726R gets very good marks. Any faults I have noted are minor in comparison to its performance and features. It is evident that a lot of common-sense thinking went into the design of this rig. Learning to sort out all the controls was painless with the aid of the manual. The ability to hop back and forth between a 10-meter sporadic-E opening and 432-MHz activity at the flip of a switch is quite remarkable. Even while writing this, I'm letting the rig scan the various calling frequencies in hopes that one of the bands will open!

For further details, write or call *Yaesu Electronics Corporation, 6851 Walthall Way, Paramount CA 90723; (213)-633-4007*. Reader Service number 476.

Richard R. Farman K2QR
Endicott NY

THE KANTRONICS INTERFACE II



The Kantronics Interface II

As an amateur enthusiast of some twenty-four years turned computer crazy, I am particularly interested in software and hardware packages that can be used in the ham shack. While the actual sending of CW, RTTY, AMTOR, and ASCII is "duck soup" for virtually any home computer, the need for an interface between the computer and the ham equipment is still a necessity. I've previously had the chance to review the original Kantronics Interface and the AEA CP-1, but I was anxious to see how the Kantronics Interface II would perform. Here are the results of my "on-line" tests.

The first thing that struck me is the size of the unit. It is small! I guess it must be my vacuum-tube background, but I always expect things that do a big job to be larger than they really are.

The next thing I noticed is that like many accessories these days, the unit does not contain or come with its own power source. I suppose this saves a few bucks and some amateurs would rather power everything off of one big twelve-volt supply. I'm not one of them.

The original Kantronics Interface, though it performed well, was sort of a minimal TU for anyone who has ever used more expensive units. The interference-rejection and signal-fading capabilities were not very good. The single bar-graph LED tuning indicator left a lot to be desired. The original was designed only for 170-Hertz-shift signals. It could be made to work on other shifts, but not very effectively. No provision was made for generating 850-Hertz-shift tones for VHF and MARS work on transmit.

The Interface II, I'm happy to say, has addressed many of these problems and conquered most of them. The unit has been completely redesigned so that it now makes full use of both the mark and space signals rather than relying on single-tone detection.

Perhaps one of the nicest features is the new tuning-indicator system. It still uses an LED bar graph, but much in the tradition of the old "magic eye" tubes of days gone by. I've used a tuning scope for RTTY and found it to be a nice luxury, but far from a necessity. With the dual-bar system used in the Kantronics Interface II, I found that tuning was just as easy and accurate as using a scope. Scope outputs are available if you still want to hook up that old tuning indicator.

The next area that I found impressive was the switch-selectable shift options. Most amateur work takes place at 170-Hertz shift, but almost none of the commercial traffic uses this shift. Units such as the AEA CP-1 allow for a variable-shift option. My experience, though, is that this is still not as convenient or accurate as having the 425- and 850-Hertz shift options switch-selectable. I'm still an old SWL at heart and enjoy tuning the press and weather transmissions. The Kantronics II is the first unit I have used that handles the commercial shifts well.

Kantronics did use one cost-saving technique for wider shifts. The same 1100-Hertz or so bandpass filter is used for both 450- and 850-Hertz modes rather than providing, say, a 550-Hertz filter for the 450-Hertz mode. This is a noticeable omission, but only slightly hampers operation at the intermediate shift.

Another nice feature is that you can hook up two different stations to the interface and select the one you want by means of a front-panel switch. This is particularly handy if you operate both an HF and VHF station using the same computer equipment.

The final new addition is an FM/AM switch. Those terms are a little misleading. Under normal conditions the TU operates in the FM mode. A small amount of audio is amplified so that it brings an op amp in the unit into hard limiting. This effectively turns over control for the signal level to the TU. Under adverse band conditions this can create a problem. In the AM mode, the hard limiter is bypassed. More audio is required to drive the unit, but you can use the audio and rf-gain controls on your receiver to more effectively control the signal going to the TU. The advantage gained can be a large one, but practice helps!

I found one major shortcoming in comparing the Interface II to the AEA CP-1. The AEA unit still seems to perform somewhat better under adverse signal conditions in the 170-Hertz mode. It also seems to permit less "garbage" through when tuning between good signals. So the choice may come down to how you feel about the availability of the commercial shifts and the switch selection between two stations. All in all, Kantronics has done an excellent job of responding to the suggestions of its customers. List price for the Kantronics Interface II is $269.95. I recommend it.

For more information, contact *Kantronics, 1202 E. 23rd Street, Lawrence KS 66044; (913)-842-7745.*

Jim Grubbs K9EI
Springfield IL

WHAT DO *YOU* THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

AWARDS

SCHOLARSHIP WINNERS

The Foundation for Amateur Radio is pleased to announce the 1984 winners of the fifteen scholarships which it administers.

John W. Gore Memorial Scholarship—$900: David J. Schmocker KJ9I, Oconomowoc WI.

Richard G. Chichester Memorial Scholarship—$900: Paul D. Sargis KI6U, Modesto CA.

Edwin S. Van Deusen Memorial Scholarship—$350: Timothy Wettach N2TW, Webster NY.

QCWA Silent Key Memorial Scholarships—$500 each: Bruce A. Wade N9UR, Glendale WI; Ian R. McNicholl KA9KOW, La Habra CA; Scott Smith KA2EMO, Malone NY.

Radio Club of America Scholarship—$500: Doyle B. Johnson KF6BD, Pleasant Hill CA.

Edmund B. Redington Memorial Scholarship—$500: David Swiatlowski KA2KLM, Camillus NY.

Young Ladies' Radio League Scholarship—$500: Diane E. Willemin N8CAY, Elyria OH.

Amateur Radio News Service Scholarship—$500: Marc C. Vernon KI9V, Hinsdale IL.

Columbia (MD) Amateur Radio Association Scholarship—$650: Eric J. Smith KA3KJO, Silver Spring MD.

Baltimore (MD) Amateur Radio Club Scholarship—$500: Richard A. White, Jr. KA3T, Mt. Airy MD.

Dade Radio Club Tropical Hamboree Scholarships—$500 each: Wayne F. Poole KC4XL, Surfside FL; Craig F. Rodgers WA4C, Boca Raton FL.

Lewis G. Wilkinson Memorial Scholarship—$500: David Cheitel KA2PNR, Bronx NY.

These scholarships were open to all radio amateurs meeting the qualifications and residence requirements of the various sponsors. The Foundation is a non-profit organization representing fifty clubs in Maryland, the District of Columbia, and northern Virginia. It is devoted exclusively to the scientific, literary, and educational pursuits that advance amateur radio. Information regarding the 1985 awards will appear in the spring in *73*.

VFN 50TH

A certificate is being offered by the Virginia Fone Net in commemoration of 50 years of continuous traffic-net operation on the 75-meter band, handling traffic into, through, and out of the state of Virginia. The net is non-affiliated but has a membership of 150 registered and numbered licensed amateurs. The VFN holds 2 conventions per year at various places in Virginia and all amateurs are welcomed. Membership information may be obtained from any net control or will be furnished with your certificate, if requested.

To obtain this handsome multicolored certificate, an applicant must make 2-way contact with 25 or more VFN members on any band *except during net operation*. Net time is daily on 3.947 MHz at 1600 and 1930 EST.

Send your log of information including the call of the station worked and the name and VFN number of the station worked to: Bill Redmond K4IEC, 917 Rockspring Drive, Winston Salem NC 27105. Include a summary log. Contacts will be verified from your list. Include $1.00 for handling and a #10 SASE, or $2.00 for a "flat pack" envelope. All certificates will be serial numbered and will be hand-lettered with the recipient's name and call. Contacts and requests must be made between September 30, 1984, and June 30, 1985.

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 4

on 220 MHz and see if it would work here. They were absolutely disgusted when the ARRL fought them and amateurs were massively against even a no-code experiment.

I would not look for much in the way of sympathy or help from the FCC with regard to fighting off commercial demands for amateur frequencies. The hobby is no longer seen as a service, but more as entertainment for a very few technical nuts which is taking up some enormously valuable spectrum space which could be much better used.

What Will Go First

The first push is to get the 220-MHz band, which the FCC had saved from CB for the no-code ham experiment. Next look for six meters to be reallocated to something more productive for the country. Then we can expect to lose most of the microwave bands which are desperately needed for business communications. Remember that communications are going to be growing by a factor of about *one million* over the next few years. Some of this will use fiber optics, some cable, but much of it will go via microwave and satellites, and that means spectrum sacrifices.

Perhaps if the FCC had been a bit more forthright and made it clear to the League directors that the choice was between no-code on 220 or losing the band, the League might not have pushed so hard to defeat the Commission. Oh, the Commission tried to make it clear, within their legal limits, but the League was not paying attention.

From the FCC's viewpoint, amateur radio is an increasing nuisance. The hobby used to pride itself on being self-policing. Now the FCC gets complaints that it isn't monitoring and policing our bands for us. It sees a bunch of increasingly retired, lazy old men sitting around helplessly wringing their hands and bitching when other hams jam their nets and repeaters, but making no real effort themselves to solve their problems.

The FCC sees today the remnants of what was once a feisty service, one which was responsible a generation or two ago for the development of virtually every breakthrough in communications—one which greatly helped the country win WWII by providing desperately needed technically-oriented youngsters—back when the average age of hams was nearer 30 than 60.

FEMA Replaces the FCC

This year the FCC even got out of the emergency communications business by turning it over to FEMA, the Federal Emergency Management Authority. FEMA has almost no connection with amateurs, so we're losing one of the last stronghold excuses for the hobby: emergency communications. What's left in the way of rationalizations for amateurs having the use of billions of dollars worth of spectrum?

Amateur radio exists at the whim of the FCC, so why are we kicking the Commissioners in the face when they try to help us? Perhaps it is a death wish by the old-timers. Did one single amateur who fought the no-code proposition think in terms of what was good for amateur radio and for our country? Or were they thinking only of the misery they had in learning the code and which should therefore be shared by all newcomers as a rite of passage? Never mind that the newcomers aren't coming, but are telling us to shove amateur radio and Morse code up our antique antennas.

Sure, I know I'm a pariah to many hams because I stand up and tell it like I see it. That's never been popular, so I shouldn't mind when ham popularity polls put me on a level with Nixon, Watt, or Oswald. From my viewpoint, I go to great lengths to do my homework before I write. My opinions are solidly based on facts. No, the attacks are usually personal, attacking me, not what I've written. Well, how else can someone fight where the facts are against them?

What Can Be Done?

With four more years of Reagan Commissioners, if amateur radio were put on the stock market, I don't think our stock would sell. What an incredible pity, for here we are at the right time in history to provide desperately needed services to our country—and to the world. The whole world is going high-tech and here we are with one of the best training grounds for youngsters to steer them into high-tech careers—and we aren't just not doing it, no, we're doing everything we can to prevent it.

With communications about to explode, amateur radio has the opportunity as never before to invent and pioneer new communications technologies. Sadly, the hams we need to do this were shut out of the hobby, so we don't have 'em available. Luckily for the world, though not for us, Japan does have the needed technicians and engineers. They came into high-tech through Japan's no-code ham license. So we're going to have to continue to buy Japanese ham gear, two-way equipment, telephones, and so on. We no longer have the technical people to keep up with their creative designing. Soon we may not even have enough technicians to service the satellite, microwave, and fiber-optic communications equipment which is pouring into the country.

If you know of any approach which will convince youngsters that they should learn the code, let me know. I'm ready to try and get ham clubs started in every high school in America, but it is a complete waste of time even trying this without some convincing explanation for the code.

No, they won't buy that crap about Morse code getting through when all else fails. Nor will they buy it being less expensive than phone. Heck, you don't believe that old bunk any more than I do—and this in my 46th year in amateur radio. If you can give me *one* convincing reason for the code, I'll be able to get started.

FUN!

John Edwards KI2U
PO Box 73
Middle Village NY 11379

CONTESTS

I'll be honest, I've never been a big contest fan. Oh, once or twice in my hamming career I've seated myself behind a microphone, intent on winning one competition or another. Unfortunately, I've never managed to do better than to win first place in the 1977 Manitoba QSO Party. Of course, I was the only New York station to participate in the Manitoba QSO Party that year, so I'm not quite sure how valuable that particular victory was.

I think I can attribute my lack of contesting enthusiasm to three factors: no antenna, no linear amplifier, and greed. Given enough money, I could easily solve the antenna and amp problems. The greed factor, however, is a bit trickier. You see, my natural avarice tends to keep me from entering contests that only offer fragments of sheepskin as prizes. A trip around the world? A 1985 Corvette? Sure. A certificate? Forget it.

Of course, the widespread cheating that goes on also turns me off. Just who regulates what goes on during these contests, anyway? Faulty IDing, the disregard of contest exchange rules, exaggerated signal reports, and just plain crummy operating practices are commonplace. Perhaps we should recruit a cadre of contest referees—hams who would be willing to tune around the bands and snitch on these creeps and cheats. Maybe then I'll be able to take contests seriously.

Anyway, for whatever it's worth, here are this month's quizzes. I feel obliged to do a column on contesting now and then, but I don't much enjoy the task.

ELEMENT 1
MULTIPLE CHOICE

1) The very first ARRL Sweepstakes was held in:
- 1) 1954
- 2) 1917
- 3) 1930
- 4) 1964

2) The very first ARRL Field Day was held in:
- 1) 1933
- 2) 1962
- 3) 1957
- 4) 1929

3) Which of the following magazines/organizations has *never* sponsored a 160-meter contest?
- 1) ARRL
- 2) *73 Magazine*
- 3) *CQ Magazine*
- 4) Quarter Century Wireless Association

4) During its heyday in the mid-1970s, approximately how many hams each year sent CW and Phone ARRL Sweepstakes logs to the League's headquarters?
1) 500
2) 1000
3) 2500
4) 10,000

5) Who is *73 Magazine's* contest editor? (No fair peeking.)
1) Robert Baker WB2GFE
2) Robert Swirsky AF2M
3) Marc Leavey WA3AJR
4) Chod Harris VP2ML

ELEMENT 2 SCRAMBLED WORDS

Unscramble these contest-related terms:

netcots	ogl	pude
plitumlire	xov	retcmopu
coclk	eky	efefoc
nananet		

ELEMENT 3 TRUE-FALSE

True False

1) In 1968, a Technician-class ham won the ARRL DX Contest. ____ ____
2) The ARRL once sponsored a contest that ran for eight months. ____ ____
3) The Helvetia Contest, held each April, is sponsored by a Swedish ham society. ____ ____
4) The ARRL once sponsored a Crossband Get-Acquainted Party to "promote fraternalism" between 15- and 20-meter operators. ____ ____
5) Most contesters use a "check sheet" to keep track of countries and/or states that still must be worked. ____ ____
6) The first ARRL VHF Sweepstakes was held in 1947. ____ ____
7) The first ARRL 10-Meter Contest was held in 1962. ____ ____
8) The first ARRL 11-Meter Contest was held in 1959. ____ ____
9) The first *73 Magazine* 75-Meter World SSB Championship was held in 1970. ____ ____
10) The winning operator in the first ARRL sweepstakes worked 20 stations in 12 sections. ____ ____

ELEMENT 4 MATCHING

Match the contests in Column A with the months in Column B.

Column A	Column B
1) County Hunters SSB Contest	A) January
2) ARRL VHF QSO Party	B) February
3) ARRL Field Day	C) March
4) *A5* International SSTV DX Contest	D) April
5) ARRL UHF Contest	E) May
6) ARRL 10-Meter Contest	F) June
7) ARRL Sweepstakes	G) July
8) Washington State QSO Party	H) August
9) *73* 40-Meter World SSB Championship	I) September
10) ARRL DX (Phone)	J) October
11) Dutch PACC Contest	K) November
	L) December

THE ANSWERS

Element 1:
1—3 In January.
2—1 In June.
3—4 Not yet, anyway.
4—3 Those were the days.
5—1 The one and only.

Element 2:
(Reading from left to right): contest, log, dupe; multiplier, vox, computer; clock, key, coffee; antenna.

Element 3:
1—False Even 1968's sunspots weren't able to provide that much help.
2—True The 1946 VHF Marathon.
3—False It's a Swiss contest.
4—False It was between 40- and 80-meter operators
5—False To keep track of stations already worked to prevent duplicate contacts.
6—True To the distress of VHF operators everywhere.
7—False Ten-meter operators had to wait until 1973 for their feelings of distress.
8—False The ARRL never held such a contest. Maybe if they had, we would still have the band.
9—False In 1982.
10—False He managed a not-so-staggering 153 stations in 43 sections.

Element 4:
1—D, 2—E, 3—F, 4—G, 5—H, 6—L, 7—K., 8—I, 9—A, 10—C, 11—B.

SCORING

Element 1:
Five points for each correct answer.
Element 2:
Two and one-half points for each word correctly unscrambled.
Element 3:
Two and one-half points for each correct answer.
Element 4:
Two points for each correct match.

How did you do?
1-20 points—Transmitting into a dummy load
21-40 points—Your elements are bent
41-60 points—A respectable performance
61-80 points—Almost a clean sweep
81-100+ points—No contest!

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

DARC CORONA 10-METER RTTY CONTEST
1100 to 1700 GMT November 3

This is the last of four tests during the year sponsored by the DARC eV to promote RTTY activity on the 10-meter band. Use the recommended portions of the 10-meter band. Each station can be contacted only once. Operating classes include single/multi-operator and SWL printer.

EXCHANGE:

RST, QSO number, name, and US state.

SCORING:

Each completed two-way RTTY QSO is worth 1 point. Multipliers include the WAE and DXCC lists, each US state, and each district in VE/VO, and VK. The final score is the total QSO points times the total multiplier.

AWARDS:

Appropriate awards to the leading stations in each classification, assuming reasonable scores.

ENTRIES:

Logs must contain name, call, and full address of participant. Also show class, time in GMT, exchange, and final score. SWLs apply the rules accordingly. Logs must be received within 30 days after the test. Send all entries to Klaus K. Zielski DF7FB, PO Box 1147, D-6455 Erlensee, West Germany.

ARRL SWEEPSTAKES
CW
Starts: 2100 GMT November 3
Ends: 0300 GMT November 4
PHONE
Starts: 2100 GMT November 17
Ends: 0300 GMT November 18

Note that these rules were taken from last year's contest. This year's rules were not received from the ARRL in time to make the printing deadline. Check *QST* for any last-minute changes!

US and Canadian stations work other US and Canadian stations using 1.8- through 28-MHz bands, excluding 10 MHz. Operate no more than 24 of the 30 hours with on/off times noted clearly in your log. Listening time counts as operating time. Operating categories include single oper-

CALENDAR

Nov 3	DARC Corona 10-Meter RTTY Contest #4
Nov 3-4	ARRL Sweepstakes—CW
Nov 10-11	Delaware QSO Party
Nov 10-11	European DX Contest—RTTY
Nov 10-12	Montana QSO Party
Nov 11	International OK DX Contest
Nov 17-18	ARRL Sweepstakes—Phone
Nov 24-25	CQ Worldwide DX—CW
Dec 1-2	ARRL 160-Meter Contest
Dec 8-9	ARRL 10-Meter Contest
Dec 26-Jan 1	QRP Winter Sports—CW
Dec 30	Canada Contest
Jan 12	73 40-Meter World SSB Championship
Jan 12-13	Hunting Lions In The Air Contest
Jan 13	73 75-Meter World SSB Championship
Jan 19-20	73 160-Meter World SSB Championship
Jan 26	73 15-Meter World SSB Championship
Jan 27	73 20-Meter World SSB Championship
Feb 23	73 RTTY World Championship Contest

FEEDLINE
BULLETIN OF THE CANTON AMATEUR RADIO CLUB
Affiliated with the "American Radio Relay League"

NEWSLETTER OF THE MONTH

One of ham radio's deep mysteries revealed itself to me the other day. I was sitting at my desk with hundreds of newsletters—most of them terminally dull—stacked around me, reading Canton Amateur Radio Club's *FEEDLINE*. There it was, a great truth, in a report on parade communications: ". . .a big thanks to each of you."

So what's the mystery? Just this: A newletter *is* as the club *does*. For each boring newsletter, there must be an equally boring club. In the Canton ARC, *everyone* participates! President Scott Duncan KK8D must be a really amazing fellow. And Editor Bill Parks K8JZN must have a tough time keeping up with all of the activity, yet he handles it with a flair for detail. Congratulations to Scott, Bill, and *every* member of the Canton ARC—you're doing one heck of a job!

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

ator and multi-operator with a single transmitter.

No crossmode contacts are allowed and each station can only be worked once, regardless of band. A transmitter used to contact one or more stations may not subsequently be used under any other call during the contest period (with the exception of family stations where more than one callsign is assigned by FCC/DOC). One operator may not use more than one callsign from any given location during the contest period. The use of two or more transmitters simultaneously is not allowed.

EXCHANGE:

Consecutive serial number, precedence (A if you run 150 W output or less, B if more than 150 W), your callsign, check (last two digits of the year you were first licensed), and your ARRL section.

FREQUENCIES:

CW—1800-1810, 3550-3650, 7050-7100, 14050-14100, 21050-21100, 28050-28100. Novice—3710, 7110, 21110, 28110. Phone—1855-1865, 3850-3950, 7200-7250, 14250-14300, 21300-21400, 28550-28650.

SCORING:

Count 2 points for each completed 2-way QSO. Multipliers are each ARRL section plus VE8/VY1 (74 max.). KP4, KV4/KP2, and KG4 stations are in the West Indies section, while KH6 and other US possessions in the Pacific count as the Pacific section. Final score is QSO points times the number of ARRL sections (plus VE8/VY1).

AWARDS:

Certificates to the top single-operator CW and phone scorers in both the A and B categories in each ARRL section, and the top multi-operator entry in each ARRL division.

ENTRIES:

Contest forms (log sheets, summary sheet, dupe sheet) are available from ARRL headquarters for an SASE. Official forms are recommended. Any entry claiming more than 200 QSOs must submit duplicate checking sheets. Incomplete or late entries will be classified as check logs. Logs should include date, QSO time, exchange sent/received, band, and mode. Postmark your entry for either mode by December 21. Send it to ARRL, 225 Main Street, Newington CT 06111.

Each entrant agrees to be bound by the provisions as well as the intent of the official ARRL rules, the regulations of his licensing authority, and the decisions of the ARRL Awards Committee. Usual disqualification rules apply.

DELAWARE QSO PARTY
Starts: 1700 GMT November 10
Ends: 2300 GMT November 11

Sponsored by the Delaware ARC. Stations may be worked once per band and mode for QSO and multiplier credits.

EXCHANGE:

QSO number, RS(T), and Delaware county, ARRL section, or country.

FREQUENCIES:

CW—1805, 3570, 7070, 14070, 21070, 28070. SSB—1815, 3975, 7275, 14325, 21425, 28650. Novice—3710, 7120, 21120, 28120.

SCORING:

Delaware stations score 1 point per QSO. Multiply total by the number of ARRL sections and DX countries worked. Others score 5 points per Delaware station worked. Multiply total by the number of Delaware counties worked on each band and each mode (maximum of 36 multipliers possible).

ENTRIES AND AWARDS:

Appropriate awards will be given to the top scorers. In addition, a certificate to all stations working all three Delaware counties. If you work all three counties and want the WDEL Award, send two 20-cent stamps and an address label. Mail logs by December 17 to: Charlie Sculley AE3H, 103 E. Van Buren Avenue, New Castle DE 19720. Send an SASE for a copy of the results.

EUROPEAN DX CONTEST—RTTY
Starts: 0000 GMT November 10
Ends: 2400 GMT November 11

Sponsored by the Deutscher Amateur Radio Club (DARC). Only 36 hours of operation out of the 48-hour period are permitted for single-operator stations. The 12 hours of nonoperation may be taken in not more than three periods at any time during the contest. Operating classes include: single operator allband and multi-operator single transmitter. Multi-operator single-transmitter stations are only allowed to change bands one time within a 15-minute period, except for making a new multiplier. Use all amateur bands from 3.5 through 28 MHz. A contest QSO can be established between all continents and also one's own continent. However, QSOs as well as QTC traffic with one's own country is *not allowed*! Each station can be worked only once per band.

EXCHANGE:

Exchange the usual six-digit number consisting of RST and progressive QSO number starting with 001.

SCORING:

Each QSO counts 1 point. Each QTC (given or received) counts 1 point. Multipliers will be counted according to the European and ARRL countries lists. The multiplier on 3.5 MHz may be multiplied by 4, on 7 MHz by 3, and on 14 through 28 MHz by 2. However, contacts within the same continent only count as a multiplier of one per band (including 80 and 40 meters). The final score is the sum of QSO and QTC points, times the total multiplier.

QTC TRAFFIC:

Additional point credit can be realized by making use of the QTC traffic feature. A QTC is a report of a confirmed QSO that has taken place earlier in the contest, which you send to another station. The general idea being that after a number of stations have been worked, a list of these stations can be reported back during a QSO with another station. An additional 1-point credit can be claimed for each station reported.

A QTC contains the time, call, and QSO number of the station being reported, e.g., 1300/DA1AA/134. This means that at 1300 GMT you worked DA1AA and received number 134. A QSO can be reported only once and not back to the originating station. A maximum of 10 QTCs per station is permitted. You may work the same station several times to complete this quota, but only the original contact has QSO point value. Keep a uniform list of QTCs sent. QTC 3/7 indicates that this is the 3rd series of QTCs sent and that 7 QSOs are reported.

AWARDS:

Certificates to the highest scorer in each classification in each country, reasonable score provided. Continental leaders will be honored with plaques. Certificates will also be given to stations with at least half the score of the continental leader or with at least 250,000 points. The minimum requirements for a certificate or a trophy are 100 QSOs or 10,000 points.

ENTRIES:

Violation of the rules, unsportsmanlike conduct, or taking credit for excessive duplicate contacts will be deemed sufficient cause for disqualification. The decisions of the Contest Committee are final. It is suggested that contestants use the log sheets of the DARC or equivalent. Send a large SASE to get logs and summary sheets (40 QSOs or QTCs per sheet). SWLs apply the rules accordingly. Entries should be sent no later than December 15 to: DARC DX Awards, PO Box 1328, D-895 Kaufbeuren, West Germany.

EUROPEAN COUNTRY LIST:

C31, CT1, CT2, DL, DM, EA, EA6, EI, F, FC, G, GC Guer, GC Jer, GD, GI, GM, GM Shetland, GW, HA, HB9, HB0, HV, I, IS, IT, JW Bear, JW, JX, LA, LX, LZ, M1, OE, OH, OH0, OJ0, OK, ON, OY, OZ, PA, SM, S, SV, SV Crete, SV Rhodes, SV Athos, TA1, UAs 1, 3, 4, 6, UA2, UB5, UC2, UN1, UO5, UP2, UQ2, UR2, UA Franz Josef Land, YO, YU, ZA, ZB2, 3A, 4U1, 9H1.

MONTANA QSO PARTY
1700 GMT November 10 to 0400 GMT November 11
1700 GMT November 11 to 0100 GMT November 12

Sponsored by the Yellowstone Radio Club of Billings, Montana. Work stations once per band and mode with Montana-to-Montana QSOs allowed. Work portables and mobiles as they change counties. No repeater QSOs.

EXCHANGE:

RS(T), serial number, and state, country, or Montana county.

FREQUENCIES:

Phone—1835, 3905, 7285, 14285, 21385, 28585. CW—1810, 3540, 7035, 14035, 21035, 28035.

SCORING:

Count one point for phone QSOs and two points for CW QSOs. Montana stations multiply total QSO points by number of states, countries, Canadian provinces, and Montana counties. Others multiply total QSO points by number of Montana counties worked (56 max.).

ENTRIES:

Mail logs by December 15 to Yellowstone Radio Club, 2626 Burlington, Billings MT 59102.

INTERNATIONAL OK DX CONTEST
Starts: 0000 GMT November 11
Ends: 2400 GMT November 11

Participating stations work stations of other countries according to the official DXCC country list. Contacts between stations of the same country count only for multipliers, but have no QSO point value. Each station may be worked once on each band. Use all bands, 160 through 10 meters on phone or CW. Crossband or crossmode contacts are not valid. Operating categories include: A—single operator all bands, B—single operator one band, and C—multi-operator all bands. Any station operated by a single person obtaining assistance, such as in keeping the log, monitoring other bands, tuning the transmitter, etc., is considered a multi-operator station. Club stations may work in category C (multi-op) only.

EXCHANGE:

RS(T) and 2-digit number indicating the ITU zone. Please note that ITU zones are quite different from the ARRL zones! For a list and map of the ITU zones, send 2 IRCs to the entry address listed below.

SCORING:

Each QSO counts one point, or 3 points if with an OK station. Final score is QSO points times the total number of ITU zones worked on each band.

ENTRIES:

A separate log must be kept for each band and must contain the full date. The log must contain in its heading the category of the station (A, B, C), name, callsign, address, and band(s) used. Also show the total number of contacts, QSO points, multipliers, and total score. Each log must be accompanied by the following declaration: "I hereby state that my station was operated in accordance with the rules of the contest as well as all regulations established for amateur radio in my country, and that my report is correct and true to the best of my belief."

A certificate will be awarded to the top-scoring operators in each country and each category. The 100 OK Award may be issued to stations for contacts with 100 OK stations, and an S-6-S Award or endorsements for individual bands may be issued to a station for contacts with all continents. Both awards will be issued upon a written application in the log and no QSLs are required. Logs must be postmarked no later than December 31 and sent to: The Central Radio Club, PO Box 69, 113 27 Praha 1, Czechoslovakia.

DX

Chod Harris VP2ML
Box 4881
Santa Rosa CA 95402

DXPEDITION TO KERMADEC

"Ron, Ron, wake up. The storm last night sank our boat! We're stuck here on Raoul Island!"

Ron Wright ZL1AMO pulled himself out of a deep sleep at 6 am to this unpleasant news. "But then I decided I couldn't do anything about the boat, so I went over to the shack and started operating."

So the unflappable DXpeditioner handled the news that his only means of transportation back to New Zealand now lay under 50 feet of shark-infested water. Operating as ZL8AMO, Ron handed out more than 10,000 CW contacts from the Kermadec Island Group, hundreds of miles north of his native New Zealand.

The Kermadec story began in 1983, when Jim Smith VK9NS contacted the New Zealand Lands and Survey Department about a joint scientific and amateur-radio expedition to Raoul Island. Jim, you will remember, led the second DXpedition to Heard Island earlier that year. Over the next few months, details of the DXpedition began to fall into place, under the guiding hand of Dr. J. L. Craig of the Zoology Department of Auckland (NZ) University.

After an exhaustive two-month search for an appropriate vessel to sail the 10-member team from Auckland to Raoul Island, both the scientific and amateur-radio teams boarded the ferroconcrete ship *Shiner* on March 13. The 18-month-old ship was registered just before sailing; this was to be its first (and last!) official voyage.

The 700-mile sail passed relatively uneventfully for the party, with some of the first-time sailors enjoying the dolphins cruising in the bow wake. The only problem was lack of wind, forcing the crew to motor almost a third of the distance. Five days later the *Shiner* dropped anchor near the loading crane, just off the northernmost (and only permanently-inhabited island) of the Kermadec Islands: Raoul.

The amateurs on the ship were in contact with the crane operator, the only amateur on Raoul, Warrick ZL8AFH. Soon the tedious and dangerous task of moving ten people, scientific gear, radio equipment, and supplies began. DXpeditioners loaded their gear into an inflatable "Zodiac" and edged closer to the sheer cliffs that mark the landing zone. Warrick swung his power crane out over the water and lowered the net to the Zodiac, which was bobbing up and down in the heavy swells. A deep sigh of relief came from scientists and amateurs alike as all equipment safely made the passage up the cliff.

Then it was time for the members of the party themselves to land. No safety net for people: just a ladder swinging on the end of the long crane. The hams grabbed at the ladder as it swung past and, hanging on tight, were whisked up the cliff, trusting to the capable hands of Warrick.

With the help of the only motorized vehicles in the Kermadecs, an old tractor and an even older truck, the five-member team permanently stationed on the island assisted the visitors to their fine accommodations. Soon the hams and scientists were comfortably installed in their quarters and ready for the serious work of the trip.

The amateur team of Ron ZL1AMO, John ZL1AAS, Roly ZL1BQD, and Duane W6REC quickly began setting up four complete stations (including an ICOM 745, ICOM 740, Kenwood TS-830, and a Kenwood TS-430). The antenna farm consisted of two tribanders and dipoles for the lower bands. The 160-meter and 80-meter dipoles were hung at the 100-foot level between towering Norfolk Pines, thanks to the climbing ability of scientist Mark Vette. Another dipole handled the 40-meter skyhook chores, as well as backing up the higher 80-meter wire.

Not long after arriving on Raoul, Ron made the first contact as ZL8AMO with N4VZ on 40 CW. Good radio propagation, especially on 10 meters, kept the QSO rate high. Everything was going swimmingly until late Wednesday night, March 21, three days after the crew landed on Raoul.

Cyclone Cyril was headed for the very exposed Raoul, so the boat captain, John Taylor, moved the *Shiner* around to the far side of the island and the most sheltered spot, Boat Cove. The three-man crew on the ship maintained hourly radio contact with the rest of the party on the island. Then, in the wee hours of the morning, the cyclone changed direction and high winds, heavy seas, and driving rain smashed into Boat Cove.

Soon the *Shiner*'s anchor began to drag, and then broke. There was nothing to prevent the ship from crashing against the rocks. All three men aboard leaped into their inflated life raft, and, thanks to a great stroke of good fortune, made it safely through the violent sea and storm to shore.

Although no lives were lost and no one was seriously injured, the boat was a total loss. While almost all the radio gear was high and dry on the island, a great deal of personal equipment and scientific gear now lay at the bottom of the Pacific. The two marine biologists took time out from chronicling new species of fish to rescue as much gear as the surf and sharks allowed. Meanwhile, Ron continued to operate, piling up more of his 10,000 CW contacts.

With their only means of transportation now gone, the party began to tune around the marine bands, looking for a ship going in the right direction. Fortunately, the *MV Vili* from Tonga was on its way south to Auckland and agreed to detour to Raoul to pick up the stranded party.

The change in plans cut the operating time short, but who knows when the next ship might have appeared. The group accepted the truncation of the operation and the additional $3000 cost and began packing their gear.

So 8-1/2 days after going on the air from Raoul, the amateurs closed down. During that time they logged more than 30,000 contacts, knocking Kermadec from 17th in *The DX Bulletin*'s Most-Wanted List right off the chart! One of the high points of the DXpedition was getting a call from BY1PK!

The amateurs left some good antennas for Warrick, so ZL8AFH could help keep the demand for ZL8 low. Warrick had a unique way of repaying this kindness.

The way off of the island was as harrowing as getting on. The gear rolled down the "Flying Fox" tram from the top of the island to the small landing platform, where Warrick stood with his trusty crane. After the gear was safely stowed aboard the landing craft, the radio operators were treated to a Raoul Island farewell: Warrick swung the hams, clinging desperately to the ladder, out over the Pacific, and dropped them straight into the water! After this ceremonial dunking, the now thoroughly-soaked hams bid good-bye and boarded the *Vili* to dry out and steam toward Auckland and home.

Ron Wright ZL1AMO

What kind of amateur turns back to the radio after hearing that his chartered ship just sank? Ron Wright says he enjoys the more relaxed pace and limited demands of a DXpedition compared to his daily job driving a taxicab in downtown Auckland. Traffic must be pretty bad if losing one's ship is more relaxing than driving!

Ron Wright ZL1AMO led four amateurs to the Kermadec Islands off New Zealand this past spring.

We can thank Ron's grandfather for his lifelong interest in ham radio. Ron first began playing with radios in high school, and in 1953 obtained his first amateur license as ZL1AMO, a call he has held for the last 31 years. During his long amateur career, Ron has remained very active, especially in contesting and DX, as well as in constructing his own gear.

Then in 1978, when his personal DXCC total stood at about 300, Ron decided the time had come to "put a little back into amateur radio in exchange for all the DXpeditions I had worked over the years." With the youngest of his 5 children well grown, Ron took some time off from guiding his taxi to join a contest DXpedition to Chatham Island, a few hundred miles east of New Zealand. While operating as ZL3HI/C in the *CQWW* CW Contest, Ron met Chuck ZL1ADI.

Pitcairn Island

Both the successful contest operation and the friendship with Chuck helped launch Ron on his DXpedition career. Their next stop was Pitcairn Island, where Ron helped meet the demand for CW contacts as VR6HI.

Transportation to and from tiny, isolated Pitcairn is always chancy. Chuck and Ron caught a freighter bound from the southern tip of New Zealand and arrived on Pitcairn a week later. After struggling up the long, steep cliff from the tiny landing area to the town, the two amateurs erected a triband, a dipole, and a vertical, and settled down to some serious radio.

Despite the mosquitos, black flies, and large, hairy spiders, the hams made plenty of contacts, relieving some of the pressure on resident amateur (and direct descendent of the colony's founder) Tom Christian VR6TC. Now the only question was how to get off Pitcairn.

The few dozen permanent residents of the island watch carefully for any passing boats (a major source of income is their trade with these ships). Whenever a ship nears Pitcairn, Tom makes contact over the radio and the islanders launch their sturdy rowboats with loads of wood carvings and postage stamps.

Ron accompanied the islanders on these trips, looking for passage off the island, hopefully toward New Zealand. The first week went by without success. Then the second week also passed without any possible arrangements. As the third week on Pitcairn rolled to an end, Ron and Chuck were beginning to wonder if they were ever going to get back to New Zealand.

Finally the *Yankee Trader*, a cruise ship which hits many of the lesser-visited Pacific islands, hove-to off Pitcairn. Yes, the captain said, he had room for exactly two people, if they didn't mind going to Tahiti.

At that point, anywhere but Pitcairn was fine with Ron and Chuck. Several days later they tried to explain to the officials in Tahiti why they had arrived without a visa. Lacking any French, it was quite some struggle, but finally both DXpeditioners were flying back to New Zealand, having made more than 33,000 contacts during their three weeks on Pitcairn.

This experience didn't discourage Ron from continuing his DXpeditioning career. Over the next few years, he operated from both North and South Cook Islands, Tonga, Western Somoa, the Solomons, Lord Howe, New Hebrides, Niue, and other spots in the region. Ron explains this wanderlust, "With my family grown, I wanted to see some of the world outside of New Zealand. With emphasis on 'seeing.' I have an eye problem that is getting steadily worse, and I wanted to hurry up and see a few things before I couldn't see them anymore."

Ron finances his own DXpeditions, saving up money from his taxi driving and sometimes leasing his cab during his longer trips. Lately he has received some help from some of the major DX foundations and radio clubs, but most of the money has come from his own pocket.

His understanding wife stays home ("She doesn't like to travel much," Ron explains) and answers the 70,000+ QSLs Ron has received from his DXpeditioning. She claims if she wasn't answering the cards, she'd be working crossword puzzles. Answering some of the cards with the wrong time or local time instead of UTC must make crossword puzzles seem like child's play.

Operating Tips

Ron's DXpedition radio is a Kenwood TS-830. He uses an Autek Research memory keyer and has recently upgraded his paddle to a Bencher model. As with most CW DXpeditioners, Ron usually operates about 25 kilohertz up from the bottom of the band: 7025, 14025, etc. Again following standard CW practice, he listens "up" about 2-3 kilohertz.

He found the pileups from Kermadec so intense that he was unable to maintain an acceptable QSO rate following normal procedures, so he resorted to some subterfuge. While continuing to say he was listening up, he actually made most of his contacts *below* his transmit frequency. "A little bit of deception, perhaps, which provided more opportunities for stations to work Kermadec," Ron justifies this unusual practice.

This illustrates the importance of one of the most fundamental operating strategies for working DX: listen for the station the DX is working, not just to the DX station itself. Chuck Coleman K6ZUR explains how he snagged ZL8AMO: "He was sending 'listen up' but I didn't hear any of the stations he was working above his transmit frequency. I tuned down below and heard one of the stations he called. I quickly zero-beat that station, gave a short call, and he came right back!"

Ron continued to work a few stations above his transmit frequency just to keep the pileup honest and to separate those DXers who were listening for the stations he was working from those with their ears glued to his transmit frequency.

Ron also likes to work down into the pileup to some extent. "The loudest stations are going to make it sooner or later, so I look for the weaker stations, the ones that might only have one chance." Let's hope not too many Big Gun DXers tore their stations apart after being beaten in the pileup by the peanut whistle down the street.

Another good way *not* to work Ron is to send your call several times. Once is enough. If you don't get through, send it once again. And don't send Ron's call; he knows who he is, and if you're in that pileup, the odds are you are calling him. (On the rare occasions that two DX stations on opposite sides of the world are trying to use the same listening frequency, you might indicate your preference.)

Ron also has little patience for the "dumb" questions which use up operating time without providing contacts. If you really want to ask him his name, location, or QSL address, wait until he's back in Auckland. "Each dumb question uses up an opportunity for someone else to work a new one," Ron explains. By the way, QSL all Ron's DXpeditions to his home call, good in any *Callbook*.

Keeping a very accurate clock is another hint toward getting a QSL card from one of Ron's DXpeditions. To save on log paper, Ron records contacts 5-10 across on his specially designed log. He notes the times for each row of contacts. In this way he fits as many as 400 contacts on a single log sheet. Obviously, if the time on your QSL card is wrong by even a few minutes, your call will be very difficult to find in that solid mass of stations.

Where will Ron be off to next? We'll have to keep our ears peeled, check the weekly DX bulletins and the local DX repeater, and practice listening to both the DX station and the station he is working, so we'll be ready for ZL1AMO's next CW DXpedition. .

Special thanks to ZL1BQD, the Northern California DX Foundation, and of course Ron Wright ZL1AMO for this column.

Listen for your loyal DX editor as T32AW from Christmas Island late October-early November. QSL via K1RH.

LETTERS

DOWN WITH CODE

As a new subscriber to *73*, I opened the magazine for the first time and ran right into your editorial message. It was surprising to find such an important and relevant message in what I thought was going to be only a technical amateur-radio magazine.

I am writing to you to express in detail my strong support for the opinions and positions you put forth in this editorial. My fear is that negative feedback from some amateurs concerning the code issue might spill over into the far more important issue you address—the importance of amateur radio as the country's main backup communication system in the case of any natural or man-made disaster up to an including nuclear war. Your concerns that amateur radio in the US may be a dying hobby, attracting few younger members, with declining strength as a market for new products or as a source of high-tech training are in my opinion true and very relevant. The current code requirements may be contributing in one way or another to all those conditions and to the detriment of the hobby; I join you in thinking that it is. But the old-timers are never going to change, and the problems may be eliminated by the upcoming computerization of code-message transmission and reception. As you point out in various articles in your magazine, with the assistance of a $350 computer and the right software, any licensed amateur operator can send and receive messages in code at speeds up to and exceeding 2000 words per minute without any personal knowledge of the code. That fact will soon allow most amateur operators to send and receive messages at a rate well beyond anyone's ability to copy manually. In an environment where it is no longer necessary to know any code to copy (even if you do you won't be able to use that knowledge in normal future QSO situations involving routine high-speed computer-assisted code transmissions), it may become even more obvious that the current code requirement is a non-productive carry-over from the past, possibly harming the hobby. Knowledge of the code is useless in the current and ever changing nature of the hobby.

Fred K. Martin
Santa Clara CA

Fred, there are a lot of active hams using code—because it is fun to use. I'm not even remotely against the code—as a fun mode of communications. My approach is purely pragmatic: We need more hams, young hams, desperately. Japan has proven beyond any argument that no-code is the answer to this one with their 1.3 million hams, so I and the FCC figured this was worth a test on 220 MHz, which is seriously underused and without a new group like this coming in will likely be lost. The ARRL led the fight opposing it, supported by ARRL clubs from coast to coast. I sure hate to see us lose 220 MHz, but it now looks like a goner, and that could start the dominoes falling, losing us the rest of the microwave spectrum. And where is communications going? Microwaves and satellites. Well, I intend to hang in there and see if I can be one of the last live amateurs, doddering into my ham shack with my walker, looking for anyone else left on 20 meters.—Wayne.

Wayne, I really enjoyed your editorials in the May, June, and July issues of *73*. I agree wholeheartedly with you that if most amateurs are against a no-code license, then these same people should be retested every two to five years to make sure they stay proficient in their code and theory.

I have yet to undersand why American hams are so uptight about having a no-code license. There are several countries, among them Great Britain, Brazil, Japan, Hong Kong, and probably others, which have some sort of no-code license and don't seem to have any problems with it. In fact, their amateur populations are growing (in some cases by leaps end bounds) while ours just trudges along. By the way, I got this information out of the "*73* International" section which I really enjoy reading.

It would seem to me that many amateurs are afraid that having a code-free license would let a lot of nuts and troublemakers into some parts of the bands. Undoubtedly they don't listen to 2-meter FM repeaters or to the 40-, 75- and 80-meter bands very often. If they did they would know that the nuts and troublemakers are already there regardless of the code requirement that is now in effect.

In closing, an interesting side note. In this month's *73* (August, '84) the results of the recent "FUN!" poll are given. In Element 2, question 16, 87% of the people polled didn't want the FCC to increase the speeds on CW exams. In response to question 24, 94% said they did not want hams to be subjected to periodic retesting. I wonder why? Could it be that they would not be able to pass the individual CW or theory tests (or both) again? They then contradict themselves in Element 3 by saying in question 35 that 70% of them can solidly copy CW at the speed at which they were licensed. Then in question 36, 72% said they could pass the theory test for their license class. If this is true, then why are 94% of them afraid of periodic retesting? Sounds very fishy to me.

Michael Friedel
Deer Park TX

Michael, a great many amateurs would much prefer to bar all further entry into the hobby in order to keep QRM down on the bands. Tests are to keep people out, not let them in. And, as you suggested, the inmates are in control of the asylum.—Wayne.

I've read *73* for years, whenever I could find it at the local newstand, but I've finally decided to subscribe. I'm not now, nor do I intend to become a ham, but I enjoy the articles and especially your editorials. Since the last time I tuned in it seems you've been doing battle with the FCC over the reason I refuse to get a license: Morse code.

Requiring someone to know Morse is somewhat like requiring a thorough knowledge of ancient Hebrew before being issued a Bible. Why bother to learn an obscure dialect when more efficient modes of communication are available? That is nonsense!

Lest someone think me a refugee from the CB-trucker mindset, let me explain. I presently work with computer-generated video—specifically, the cockpit displays in the Navy's F/A 18A Hornet fighter. This technology could easily be put to good use on the amateur bands. Can you imagine how many youngsters would become interested if they could plug the Intelevision into Dad's moonbouncer for an interactive game of real star wars?

You keep working on 'em, Wayne! I'd be Extra class tomorrow if it weren't for this "dah-dit-dah" stuff.

F. C. Glascock
Hanford CA

No, FC, I give up.—Wayne.

I have just learned something about ham radio, and after reading your May and June editorials, I am writing to tell you how right you are. I too am retired and seeking a communications medium to combat the boredom that losing daily contact with others brings.

I have only been involved in ham radio since May, and am frustrated by the difficulty encountered in acquiring information about the hobby. It's sad to see such a fine hobby suffering from a lack of publicity.

I have also developed a deep appreciation for the potential for major service by hams to our country in times of an emergency. In Connecticut, Governor Grasso was so pleased by the service hams rendered during the terrible blizzard of several years ago that she signed legislation enabling ham operators to obtain callsign license plates for only $5. Most Connecticut hams don't even know about it.

As I began reading your appraisal of the current status of the hobby, I sensed immediately that you were correct. Here I am, another old duffer joining the ranks instead of a high-school student. Certainly ham radio should be made available to them today. The various Boards of Education must take action. But, after serving three terms as our town's First Selectman, I know how very difficult it is to change ponderous democratic practices.

I am laboriously learning Morse code. As far as that is concerned, one need only listen to the bands to know that CW is obsolete and should be abandoned by hams in their licensing procedure.

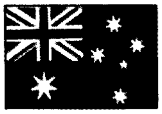
Don't stop fighting for change! I already share your views, and when I get my General-class ticket I'll do whatever I can to join you in the battle. In the meantime, keep your speed up.

Norman E. Brown
Brookfield CT

73 INTERNATIONAL

Each month, 73 brings you ham-radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Perry Donham KK2Y.*



AUSTRALIA

J. E. Joyce VK3YJ
44 Wren Street
Altona 3018
Victoria
Australia

ANOTHER NOISE GENERATOR

Australia is about to get the German-standard stereo system, and it has caused a large amount of comment within the amateur fraternity due to both the likelihood of this system being susceptible to amateur transmissions on both 2 and 6 meters and the fear that there will also be interference to the amateur service over a large area because of the transmission frequencies of this dual-sound system's audio carriers.

The WIA (Wireless Institute of Australia) has written to the Minister of Communications in regard to this matter and a letter has been received back, but the reply is not very helpful to the amateur community.

In essence, the reply says that in the interests of making available this advance in broadcasting technique to the general public, Mr. Duffy, Minister of Communications, is asking members to accept any small inconvenience to their service which might occur in some geographical areas.

This I feel will also (when propagation is right) include areas as far away as Japan and the Pacific Ocean Islands, New Zealand, or anywhere that can receive 144-MHz and 51-MHz signals from Australia, the reason being that channel 5A, which is one of our problem TV channels down here, operates on 137-144 MHz and is used by the National Broadcasting Service.

The channel 5A vision carrier is on 138.25 MHz and the sound carrier at present is on 143.75 MHz. The second sound carrier for stereo TV will be located 5.742 MHz above the vision carrier, placing it only 7.8 kHz below our 2-meter band allocation. Going by stated deviation figures for stereo sound in the television industry, however, a deviation figure of 50 kHz can be expected, placing it into the first 100 kHz of the amateur band.

This should make all of those amateurs, both locally and internationally, who are experimenting in the 144.0-to-144.1-MHz section of the band, less than happy—to say the least.

Channel O is the other problem area as it operates on 45-52 MHz and is operated by the ABC plus NBS, catering mainly to ethnic television transmissions.

As you can see by the above, our 2- and 6-meter operations now have the potential for interference problems even without this new addition.

The Channel O first sound carrier is on 51.75 MHz, with the second sound carrier for stereo TV being located around 51.992 and deviated to (approx.) 52.042. This puts it nicely into the international 6-meter amateur band.

This latest intrusion by other services into the amateur bands could prove a greater headache, interference-wise, than the computer and VCR craze we are presently going through down here.

At the present rate of introduction into this country of rf-susceptible devices for general public use, we amateurs soon will need to have either a degree in interference engineering or very, very friendly neighbors.

VK3—150-YEAR AWARD

It is a long way back from today's celebrating of our 150 years of statehood to those first years of European settlements in the southern part of Australia.

The first purchase of land in what was to become Victoria (VK3) was made by John Batman in 1835 when he bought two million acres of land surrounding what in those days was known as Port Phillip. This land was purchased from a local aboriginal called Fudgaree for the princely sum of one dozen blankets, six dozen tobacco pipes, 150 figs of tobacco, and two bottles of rum!

John Batman marked off a site on the northern shores of Port Phillip Bay for a town that he was going to call Batmania. Luckily for us this town was eventually called Melbourne, otherwise we down here would undoubtedly have been called Batmen or Batwomen.

To celebrate our 150 years of statehood, the WIA will sponsor, from November, 1984, until April, 1985, a Victoria 150 Award Certificate.

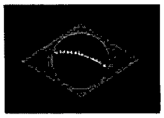
Award Rules

Overseas amateurs have only to either contact or, in the case of SWLs, log one VK3 station to be eligible for this award. Mail claims to Victoria 150 Award, Wireless Institute of Australia, 412 Brunswick Street, Fitzroy, 3065, Victoria, Australia. You must include either a log extract of the contact or the claimant's QSL card, completed with OSO details for their VK3 contact, plus $2.00 to cover the award and postage.

The Victorian State Government is helping to print this Victoria 150 Award and has permitted amateurs to use a special "Victoria—Growing Together" logo on their QSL cards.

AX PREFIX

Our Department of Communications usually grants the use of the AX prefix for special events, such as the above. Unfortunately, it has been found that while most Australian amateurs who use the special AX prefix do the right thing by fellow amateurs, there are always the few who use these special-event callsigns for DX contacts and fail to honor any OSL obligations. Trying to remedy this situation, the WIA has requested that unless amateurs using special calls are prepared to QSL on request, they should use their VK prefix only and leave the AX to those amateurs who will QSL, thereby improving our overseas image regarding the return of QSL cards.



BRAZIL

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20270 Rio de Janeiro, RJ
Brazil

CW AWARDS IN BRAZIL

Brazilian CW groups are almost sure that awards are the best way to interest and develop CW operation amongst radio amateurs here. Although we have plenty of contests, it seems that freedom to operate at will and depending on available time and dates according to each one's peculiarities, awards are much more convenient to be worked than contests with all their pileups and QRM and limited time and dates.

So CW groups are doing their best to present interesting awards to hams. These are the latest three CW awards, just born for our entertainment:

CWSP YL Award—available to all radio amateurs and SWLs for proof of two-way QSOs with five Brazilian YLs, CW mode, two of them being CWSP members. Endorsement seals are available for 10, 20, or 30 YL stations from anywhere, CW mode only (YL CWSP members: PY2ATL, PY2ADI, PY2DHP, and PY2TR are always present on the BRYLA net). Do not send QSLs, but rather a certified log; fee is 10 IRCs; send to CWSP Award Manager, PO Box 15098, Sao Paulo, 01599, SP Brazil. Valid from May 1, 1984.

Coming from the CWGO group, Goias, are two new awards: *WAPP 2nd Series*—the Worked all PP-prefixed areas, 2nd Series award is available to all radio amateurs and SWLs for proof of two-way QSOs with 6 different CWGO members and 5 stations from different PP-prefixed call areas: PP1-, PP5-, PP6-, PP7-, and PP8. QSOs valid from January 1, 1984, on CW mode only.

DIB CWGO Award—the Diploma Interior Brasileiro (Brazilian Inland Award)—available to all radio amateurs and SWLs for proof of two-way QSOs, only CW mode, with all nine inland states (no ocean-bordered). QSOs valid from February 28, 1984, on. States are: PP2—Goias, PP8—Amazonas, PT2—Brasilia, Federal District, PT8—Acre, PT9—Mato Grosso do Sul, PV—Roraima, PW8—Rondonia, PY4—Minas Gerais, and PY9—Mato Grossop. PP2 Goias must be represented by six CWGO Group members. If two more CWGO members are worked, they can be used to substitute for two of the inland states.

Do not send QSLs. Logs, certified by a radio-amateur association or by two radio amateurs, are acceptable. The fee for each CWGO award is 10 IRCs. Send to CWGO Award Manager, PO Box 676, CEP, 74000, Goiania, GO Brazil.

CWGO members list: PP2-AAM, -ABE, -ABV, -ACJ, -ACK, -AEP, -AGS, -AHR, -AML, -BD, -BS, -BT, -BW, -CD, -CE, -CH, -CW, -CY, -CZ, -DN, -DO, -DV, -DX, -EHE, -EM, -FCZ, -FN, -FUT, -GHN, -INC, -JB, -JQ, -JT, -MMO, -RR, -RS, -SJ, -US, -VR, -WT, -WV, -XI, -YY, -ZI, PY3YXZ/PP2, PP2CW being the CWGO station call.

Brazilian CW groups realized that amusing-rules awards are the best way to develop radio amateurs' interest in CW operations, and so efforts are all towards this direction.

PPC Picapau Carioca (Carioca Woodpeckers Group), the oldest of CW groups in Brazil, is now coming to its 20th year having almost reached its "20 Awards Program," a sweeping and amusing program to meet all interests—with some not-so-difficult and some not-so-easy awards, and plenty of fun to amuse all and to enhance CW practice among Brazilian radio amateurs.

The just-launched *PPCMC Members and Countries Award*, joining DX countries (ARRL list) and PPC members, with a special Honor Roll Award when 200 points are reached (and a basic award at 50 points—at least 40 DX countries) seems to raise unusual interest due to the "permanent" classification list like the DXCC. QSLs are valid from January 1, 1980, so old-timers can join the fun of new hunting.

The *PPCPU Award* is presented to welcome new class-C PU prefixes. The basic award is obtained by proof of 9 PU QSOs, from PU1 to PU9; later endorsements are for the remaining 18 possible PU calls, according to suffix letters allocated to each of 27 Brazilian states and territories.

The three-class *PPC Samba Award* (South American Maritime Borders Award) is another very amusing game to be launched pretty soon, with interesting conditions and rules.

Keep an eye out for Brazilian new awards! They are fine!

CZECHOSLOVAKIA

Rudolf Karaba (OK3KFO ARC)
Komenskeho 1477
955 01 Topolcany
Czechoslovakia

CRC, PO Box 68, 113 27 Praha 1, Czechoslovakia, is offering these awards for non-European countries:

P-75-P is awarded for contacting or listening to stations in various ITU zones. There are 75 zones altogether, and three sorts of awards are available: 3rd class for contacts with 50 zones, 2nd class for contacts with 60 zones, and 1st class for contacts with 70 zones.

All contacts since January 1, 1960, irrespective of the class of operating service or the band used, are valid for the awards. It is necessary to send the applications together with 10 IRCs and QSL cards to CRC. A list of zones can be found in the *Callbook*.

S-6-S is awarded for contacts with one station on every continent on one mode. Endorsements for separate bands are available. Contacts after January 1, 1950, are valid.

It is necessary to send 5 IRCs and QSL cards to CRC.

More in my next column.

AMSAT

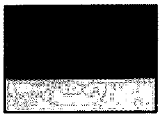
At the end of March, OK3DQ from Nizna nad Oravou in northwestern Slovakia started using AO-10. Jan is using a 30-Watt SSB/CW transmitter with a 21-element yagi (F9FT). His receiver has a BF981 transistor or three SK-97s, and a 2 × 10 element yagi—PA0MS. Both the an-

tennas are of vertical polarization. He is praising a busy operating service that in his bad QTH is a pleasant change in VHF/UHF. During the first two weeks of operating in mode B, he established 272 contacts (115 of them SSB) with 48 OXCC countries. By operating SSB he heard another Czechoslovak station, OK1VKP.

OK1BMW (maybe also other Czechoslovak stations) received a QSL card from W5LFL for listening to the signals from the sky!

RTTY IN CZECHOSLOVAKIA

Nearly 40 stations from Czechoslovakia are working actively on RTTY. Radio club OK1KMU is another new station. During 6 months there have been established contacts with more than 25 DXCC countries in 3 shortwave bands. In the 144-MHz band, they have had contacts with 5 stations from Czechoslovakia and 4 stations from West Germany.



FEDERAL REPUBLIC OF GERMANY

Ralf Beyer DJ3NW
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3300 Braunschweig
Federal Republic of Germany

IARU—REGION 1 CONFERENCE

The International Amateur Radio Union, Region 1, represents 55 national amateur-radio societies with about 250,000 licensed amateur-radio operators. Their last triannual meeting took place in April, 1984, in Cefalu, Sicily, Italy. Among the very many topics discussed, some got my particular attention.

First, the IARU proposed a new statute to its members in Regions 1, 2, and 3 which has been accepted in the meantime. Now each region will have a chance to send two representatives to the IARU Administrative Council. Together with the regulation that the office of the IARU must not necessarily be associated with the ARRL offices in the future, the new statute offers a chance to assign responsibilities and duties to an internationally more balanced group than was the case in the past. However, the ARRL has been elected again to take care of the "International Office" of the IARU.

Second, from time to time small steps towards a political union of the European Community (EC) are achieved. The latest achievement in this respect is an agreement between France and the Federal Republic of Germany that motorists need not stop and identify themselves at the border between the countries any more if they have nothing to declare.

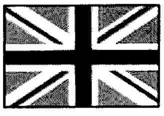
It is only logical that the IARU, Region 1, would formulate similar goals like, for example, an international amateur-radio license. However, it will be difficult to come to such an agreement within the EC because of the sometimes very different national license regulations. I consider it rather impossible in the foreseeable future to agree on an international amateur-radio license which is honored in all countries of Region 1 because of the sometimes severe conflicts involved.

Nevertheless, some days later at the CEPT Subgroup R21 Conference in Madrid, Spain, an interesting approach to the problem was developed. It aims at a multitude of bilateral agreements which, in fact, could form a solid basis for a truly international amateur-radio license in the future.

And last, the IARU, Region 1, attempted to reduce the number of contests on all shortwave bands and formulated the following recommendations: Limit all contests to a maximum duration of 24 hours, assign only one weekend for the phone and/or CW portion of a contest, merge smaller contests into larger ones, and have only one large and one small contest per month in Region 1.

Furthermore, it was recommended to limit contest operation on 80 and 20 meters to the following band segments: 3500–3560 kHz and 14000–14060 kHz for CW and 3700–3800 kHz and 14125–14300 kHz for phone. I personally would like to see even tighter restrictions. On an annual basis, I'd like to suggest that only 5% of the number of weekends (52) times the available frequency spectrum (300 kHz on 80 meters plus 350 kHz on 20 meters in Region 1) should be available to contesters—$.05(52 \times 650) = 1590$ frequency-hours. It would then be up to the contesters how they utilize their available time. For example, they could run 2–3 full contests per year the usual way or 8–9 contests per year employing only 200 kHz of the available frequency spectrum on 80 and 20 meters and so on. Wouldn't this make sense?

The next IARU Region 1 Conference is scheduled for 1987 in the Netherlands. Then it will be the time to review the progress they—and we—have achieved in the meantime.



GREAT BRITAIN

Jeff Maynard G4EJA
10 Churchfields
Widnes WA8 9RP
Cheshire
England

THE UK SCENE

The difficulties of obtaining convictions in cases of illegal use of transmitting equipment in the UK (and including the pirating of amateur bands) are eased somewhat by the provisions of the Telecommunications Act 1984, which received the Royal Assent and therefore became embodied in the law of the land in July.

To date it has been necessary for the police (we do not have an FCC equivalent) to catch offenders in the act of transmitting in order to be assured of a conviction. Just as soon as the knock came on the door, the offender would power down and so be largely immune from prosecution. The possession of equipment capable of transmitting on frequencies for which the owner was not licensed was not, in itself, a felony.

The new act conveys wide powers, both to the police and the newly-formed Radio Investigation Service (which used to be the Radio Interference Department of British Telecom), both of whom are given powers to seize equipment allegedly used for illegal transmissions. The courts may also order forfeiture of equipment without any criminal proceedings being initiated.

The act also provides new powers for the Secretary of State to "restrict the sale and possession of specified wireless telegraphy equipment" and to "carry our approval of equipment and require marking of apparatus."

The former provision raises the specter of a ban on 28-MHz linear amplifiers (similar to that imposed in the US) to prevent their use as "burners" by CB operators in the 27-MHz band. Such a ban is not likely to achieve its laudable aims, of course, since the illegal users can always find something else to occupy themselves, but it does deprive genuine users of the ability to acquire a particular facility.

The latter provision makes me wonder if the authorities ever take any notice of rules and regulations that have been previously implemented. The liberalization of British Telecom and relaxation of their monopoly included the provision that subscribers could, for the first time, buy extension and other telephone equipment from high-street stores.

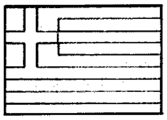
In order to protect BT's network, it was decided that only equipment marked with a green dot and the word "approved" could be connected to a BT-supplied telephone outlet. Equipment not so approved must be marked with a red triangle and the words "not approved." So far so good, but if an article cannot be connected, is there any point in allowing it to be sold?

If I take a walk down London's Tottenham Court Road—the mecca for hi-fi, video, and computer enthusiasts—I can see approved and non-approved equipment side by side in the many shop windows. The non-approved equipment tends to have more facilities and be cheaper than that with the green dot. I do not think it requires too much guesswork to figure out which equipment sells the most. One can envisage a few years hence the ham shop selling a 440-Watt approved linear and a 2-kW non-approved one—quite a dilemma for the DXer!

Finally, with the Telecommunications Act 1984, the police are given some powers of arrest without a warrant in cases of illegal transmitting where a question of identity arises. I wonder if this could result in the need for hams to carry some form of ID card?

The RSGB has launched a monthly circular called *VHF/UHF Newsletter* to keep devotees of the shorter-wavelength bands fully up to date. Subscription for 12 issues is $6.00 for UK subscribers—$10.00 should be enough for any airmail costs to be covered. Enquiries to the RSGB at Alma House, Cranbourne Road, Potters Bar, Herts EN63JW, England.

This month's column is a little shorter than usual because I am rather busy with a new job. This is as General Manager of the telecommunications branch of a major airline. In addition to the thousands of data terminals worldwide, the UK telephone system, and the airport PMR and departure control systems, I have discovered I also have responsibility for a major HF station. That may well provide some interesting material for the future...



GREECE

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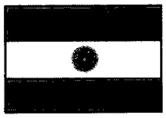
Since as I'm writing this month's column we are in the middle of the summer, it is very hard to get in touch with most of my fellow SV DXers. Therefore, I have to stop for the time being introducing them, but for sure I'll come back later when everybody is back home and accessible.

These past few months we heard a new repeater that came on the air from the city of Kavalla, up in the northeast part of Greece. This one works on European Repeater Channel R7 and looks like it will be able to cover the northern part of the Aegean sea and most of the national road that connects Thessalonica with all major cities in northeast Greece up to the border with Turkey.

There is also another one that is expected to be installed very soon on the island of Kefalonia, but more news on that when it is on the air.

I would like to point out that since Greece is mostly a mountainous country, we need to have as many repeaters as we can, not only to cover the national roads and to give to amateurs in the whole country the opportunity to communicate with each other, but we need the repeaters for emergency communications—such as during earthquakes, fires, and so on.

I can assure you that we have plenty of both, especially during the summer when we have hundreds of fires in all Greek national forests. Then repeaters can prove to be very useful, as they can establish communications between city and forest departments with the assistance of radio amateurs who provide the necessary eyes for them. I'm sure that every country can take advantage of radio amateurs and their knowledge of communications, especially in times of disaster.



INDIA

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DUTY-FREE IMPORTS FOR INDIAN HAMS

Indian hams have something to rejoice about—import duty has been completely waived on amateur equipment. The waiver covers not only transmitters, receivers, and transceivers, but also gadgets like Morse-code readers and aural frequency readouts.

This move—license-free, duty-free import—could conjure up visions of ham shops full of amateur equipment. There is a catch to it, however. The user alone is entitled to import the equipment, so that each amateur has to import one piece of equipment and dealers cannot import for stock and sale. To be eligible for exemption from duty, the importer should obtain a license from the Wireless Adviser to the Government of India (counterpart of FCC) before the equipment is received in India.

Amateurs can join together and import equipment under a joint bill of lading or can give a letter of authority to a dealer who then can import a consolidated shipment as their agent. One dealer, VU2TP, agent for Yaesu, tried to put together a group of over 75 for the FT-77 at a discount of over 20% over the normal rate. He enrolled over 100, but could never quite make it. Enter the 757GX, and the FT-77 group dwindled to well below 75. Back to square one!

Now is the time for anyone wishing to send gifts of new or used equipment to Indian amateurs. Here is the checklist:

- Notify your donee that you propose to give him equipment as a gift.
- Enclose a catalog page, preferably showing the price. The amount of the price is immaterial—he can receive up to US$870 in a fiscal year (April to March) and does not have to pay a cent of duty.
- If no price is listed, obtain a quotation from your local friendly dealer or make a copy of any classified ad to establish a price (any price!). If you are offering home-

brew equipment, enclose a declaration that it was homemade and that it cost you so many dollars.

- Wait till the donee confirms that he has the WPC license for this specific piece of equipment. *Only then can he import it duty-free.*
- Ship it by any mode; surface mail, air mail, air cargo, or even sea cargo, but *not* as passenger baggage. Ham equipment as baggage *is not eligible* for duty-free entry.
- Send the bill of lading to the donee by air mail. If sent by air cargo, QSP to him the particulars of the bill of lading or send him a cable. Demurrage on air cargo is quite heavy and could add up to a hundred dollars in eight weeks.
- Do not ship by air cargo to donees who are not in the cities of Bombay, Delhi, Calcutta, Madras, or Bangalore. Others will have to make arrangements at one of the entry points to file a bill of entry and to clear the parcel through customs.

The Indian amateur can import components, too, but only as spares for equipment that he imports. Obviously, this bit has been influenced by commercial interests—the home-brewer still has to pay duty if he wants components. Strange situation, but one learns to take these in one's stride. The Federation of Amateur Radio Societies has made representations that the home-brewers' imports of components (not spares) should also be exempt from duty. Let's keep our fingers crossed!

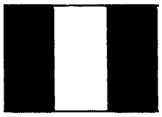
Here is the full list of equipment and components that are exempt from import duty:

Wireless Apparatus and Accessories

1. HF transreceiver (transceiver) meant for amateur frequency(ies) with accessories.
2. VHF transreceiver meant for amateur frequency(ies) with accessories.
3. UHF transreceiver meant for amateur frequency(ies) with accessories.
4. VHF/VHF or VHF/UHF repeater (combination of transmitter and receiver) with accessories meant for amateur frequencies.
5. Control unit for the 4 items above with accessories.
6. Aural readout displayed frequency.
7. Aural readout displayed time.
8. Aerial/antenna for amateur frequencies.
9. Balun transformer.
10. Swr bridge or reflectometer.
11. Digital frequency counter (up to 600 MHz) with accessories.
12. Morse reader.
13. Noise bridge.
14. Microphone (with or without loudspeaker).

Components

1. Transistors, diodes, integrated circuits/chips.
2. Thermionic valves or vacuum tubes.
3. Toroidal cores.
4. Quartz crystals.
5. Variable condensers, air-dielectric type.
6. Precision capacitors (fixed type), value(s) between 1 pF and 5000 pF.
7. Relays.
8. Rf cables.
9. Spare nicad cells or pack as required or used with items 2 and 3 above (in case of hand-held transceivers).
10. Rotary switches.
11. Keyer paddle.
12. Ferrite beads.



ITALY

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18 AND 24 MHZ

It is a few months now that 18 and 24 MHz have been used by Italian hams, but there is not too much activity. If you open your rig there you will only find QRM. The reason could be the fact that no Ws or JAs are allowed there, but maybe there is another reason. The fact that both bands, by IARU decision, are not used during contests and are not valid for any award probably keeps us off them. The reason for the IARU decision was justified by the need for not having all of us there together, but it seems they have obtained the opposite result: nobody is there. The cost of antennas with practically no return in terms of what is wanted by DXers (contests and awards) is too high. According to old-timers, this happened also to 21 MHz years ago, so probably it is not necessary to worry too much; we're waiting for our friends from Japan and the States to come and give some life to the two new bands.

UHF SHF

Years ago the I2X beacon was installed in Milan, operating with 40 mW on 10 GHz. The results have been very good; the beacon was well received within a range of 250 kilometers, with mostly late-evening openings. During the month of July, IØSNY of the 10-GHz world record will be back in North Africa trying to set new records, working 24, 10, and 1.2 GHz, and offering the possibility to have a new one to many Europeans on 144 and 432 from EA9.

DINO ISLAND EXPEDITION

Dino Island is located in Calabria very close to the coast. (This answers all those that have asked for it as, being very small, it is not on normal maps.) It is very easily reached with a small boat and is populated only during the summer by tourists living in a small village.

The island was activated for the first time in June, 1983, with the call ID8UDB, a new prefix and a new IOTA number. It was activated mainly on CW (95% of the total QSOs) by three operators of INORC (Italian Naval Old Rhythmers Club) and the DX Blue Team: I2BVS Enzo, I2DMK Max, and I2NYN, his son, Marco.

The operation started on June 7 and ended June 14 with 5600 contacts, most of them on 14-MHz CW, as the propagation was quite poor. The antennas used were a two-element beam for 10, 15, and 20 meters installed on top of a 10-meter portable tower of only 8 kilos, and a ground plane for 80–10 meters.

The ground plane was not working too well on 40 meters and a new antenna was installed, coupling a 12-meter longwire to the metal tower. The sloper so obtained was working perfectly, giving satisfaction in working many USA, JA, and VK stations on 40. As said above, 20 meters has been quite good while 15 has been very lousy. 10 meters has been offering short-skip openings to Europe and some sporadic-E to South America. QSL cards via I2MQP.

9X5GB

If you have the opportunity to work the above callsign (it is not yet official as the station has been working up to now with the call I2XDP/9X5), you will realize, upon receiving the QSL card, that it is not a normal station. It is the station of the hospital run by Italian missionaries in Musha and, on top of it, it's working with the power of solar panels that are linked to two batteries of 12 V, 66 Amps. The rig is an FYT-707 and the antenna is a 3-element by Hy-Gain.

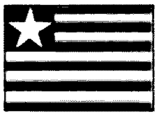
Other solar panels are linked to batteries that are used to serve all the mission. Of course the strength of the sun in Rwanda must be consistent to do such a beautiful job, but the Black Continent and Italian ingenuity can offer you more surprises—like the 5H3KG station (another well-known call run by another Italian missionary) that is powered by the wind. I will offer you more news on it in a future column.

WORKING THE LOW BANDS

Due to the actual slowdown of sunspot numbers and thanks to the new life given to the low bands, a new antenna is becoming popular in Italy. It's the DB24, the 4-element by Hy-Gain, with two active elements on 40 and two on 20. The price is quite attractive, being about $180 while you have to pay more than $650 for a TH7DXX. So, if you find many more stations during the next contest season working on 40 from Italy, you can bet that many of them are using it.

Always staying on the low bands, a modification to the well-known W3DZZ has been offered in the July issue of the Italian amateurs' magazine by IØNQT, allowing the popular dipole to work on 160 meters. Two traps have been added with 33 feet of wire. The antenna is working very well.

The first contact between Italy and Australia has been made by I2BBJ and VK6HD on April 25. The contact was made feeding the 30-meter tower you can see in the photo.



LIBERIA

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AMATEUR RADIO IN LIBERIA

The Ministry of Post and Telecommunications called a meeting of all the amateurs in Liberia. It was called in conjunc-

Dino Island.

The I2BBJ end of the VK6HD-Italy contact.

tion with the Liberia Radio Amateur Association (which did put out an agenda), but the object of the Minister's interest in the meeting was not given. The Ministry expressed a degree of urgency in their notices to the amateurs to attend the meeting and implied that absence without good reason would not be taken lightly.

The amateurs came into Monrovia by air, by private automobile, by taxi, and by whatever mode of travel was available, and the meeting was the best attended and the most successful that I have seen in my three and a half years in Liberia. As the assembly gathered, there was tension in the air and everyone walked around with a feeling of apprehension. As it worked out, this apprehensive feeling proved to have been unfounded, however; this meeting was some kind of a first and no one knew just what to expect.

The Minister—actually the Assistant Minister in charge of radio operations—opened the meeting. One could have heard a pin drop. Sensing the tension, the Minister did what he could to make everyone feel more relaxed and comfortable. He welcomed those present and expressed satisfaction at the number who had responded to his call. A roll call indicated that upwards of ninety percent of the amateurs of Liberia were in attendance. Those who were not present were either out of the country on leave or at work in a position that did not permit absence.

The Minister did not keep the group waiting. He stated simply and briefly that a problem was developing in Liberia in the area of third-party traffic and other markedly commercial (and therefore illegal) communications in the amateur bands. He said that complaints were coming in from countries outside. He pointed out that for many years Liberia has enjoyed an enviable reputation in the world of amateur radio for its courtesy and its observance of national and international law, and he said that the Ministry and the amateur community of Liberia is very jealous of this reputation and will preserve it.

He was quick to mention that the problem is not widespread. The aim of the Ministry is to see to it that the problem does not grow. He asked the cooperation of the amateurs to eliminate the problem completely.

I have noted in other columns that I have sent to *73* that I have been greatly edified by the caliber of courtesy and the observance of amateur regulations here in Liberia. I have a hunch that these few problem-amateurs are expatriates. If this is true, it is unfortunate because the Ministry of Post and Telecommunications has been most generous in licensing people who are not citizens of the country. As an instructor in amateur radio and as a member of the examination committee, I have been working rather closely with the Ministry and there is not a single instance, in my experience, in which a foreigner, of whatever race, has been denied a license when he has completed the requirements in code and theory.

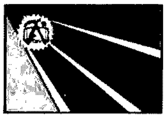
This is not true in all countries. I personally was denied a license in another country where I was working for eight years simply because I was not a native. At least that is the reason that was given. We, who are visitors in Liberia, would do well to cooperate with the Ministry and observe the law.

The Minister spent the greater part of the meeting encouraging the amateurs to be more active, to participate in the local nets, and to join the Liberia Radio Amateur Association. He suggested that the amateurs use the facilities of the Association to handle QSL cards, going and coming, and to work with the Association in instructing and training new amateurs. He recommended that local areas organize clubs or associations so as to coordinate their efforts to manage and develop the amateur community in Liberia.

In the meantime, the Association is working on a program for Amateur Radio Week. It will be held in the latter part of November or the first part of December, and while things are in no way finalized, it is fairly certain that there will be a special callsign for that period. There will be a special-event station and there may be awards. Turn your dial, look for Liberia, and take full advantage of this opportunity! There will be publicity. Be on the alert and don't miss it.

The Association again petitioned the Ministry for a spot in the broadcast band to transmit code for practicing beginners. The proposal was well received and it may well be that, one of these days, there will be something to report in this area.

We, the amateurs of Liberia, look forward with confidence and hope. We are sure that we will continue to grow in strength and prestige as we hold our place among the amateurs of the world.



MOZAMBIQUE

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Department of State
Washington DC 20520

Greetings from Maputo (old name: Lourenco Marques) by the beautiful Indian Ocean. No, fellows I don't have a license yet. As of this writing, amateur radio is "suspended" in the People's Republic of Mozambique. I am a foreign service officer, and in the diplomatic lexicon "suspended" is better by far than "prohibited" or "cancelled." If an activity is "suspended," then the authority is stating that the condition is temporary. I still remain very optimistic that amateur radio will return to Mozambique.

Mozambique has a full share of the typical third-world nation's problems. It is one of the most miserably poor nations on Earth. In 1983, 100,000 people starved to death. (Your tax dollars are supporting the largest aid program on Earth to get food to the people here.) Three out of five Mozambicans cannot read or write. Virtually all the technicians in the country are foreigners from Europe or the communist bloc.

The main reason for the absence of amateur radio is the fact that the country is undergoing a massive guerrilla insurgency. This city of 850,000 people is virtually cut off from the outside world as far as overland travel is concerned. Add that to the government's general paranoia and distrust of foreigners, and it is apparent that amateur radio is not at all welcome under the current security situation.

My wife Yee's (N4GPB) and my chief concern is food. The currency here is virtually worthless. The official exchange rate is 40 per US dollar, but the free-market rate is 1500. The currency cannot be converted at the official rate. The stores have no food and the restaurants serve only a rice-water gruel. When the road to South Africa is open, it is a 5-hour drive to the grocery store. Now that the road is closed, we have to get our foodstuffs shipped in and rely on the "hard" currency shop here in Maputo.

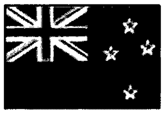
As far as ham radio goes, I am occupying my time by teaching ham radio to four other Americans and modifying my gear to run on 220 V, 50 Hz. My house servant plugged my 24-hour digital clock into the 220-V current and blew it up. It cost more than he earns in three months. Most Mozambicans earn less than the cost of a 2-meter transceiver in a year.

My house was built before electricity and the wiring is adequate, but nothing fancy. I am getting additional outlets and transformers installed in my radio room. We get television from ZS and 3D6 here, so the city is filled with towers and antennas. I am getting a 60-foot tower installed and I will hang my tribander on it. I have been monitoring the bands and have heard many US stations on 20m, but I have not heard any amateur stations on 30m here yet.

I have been doing preliminary research into the possibility of running a DXpedition to some of the offshore islands. The French have a large embassy here, and I can easily arrange transport to Europa and Juan de Nova islands. The western diplomatic community here is very close, and arranging the landing permits and operating permission should present no real problem.

I will remain in Mozambique for at least two years, perhaps until 1988. I am hopeful that I will receive operating permission before I depart. Mozambique is a difficult and uncomfortable place to live, and amateur radio would make it much more pleasant. I am planning to visit several of the nearby countries during my stay here, and I plan to operate from several of them.

I have never run a DXpedition before, so if any *73* readers could offer assistance in DXpeditioning, I would be most grateful. Unfortunately, there is no "handbook."



NEW ZEALAND

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This month I shall continue the New Zealand offshore islands' stories with an excerpt from the Raoul Island expedition story, through the courtesy of the author, Roly Runciman ZL1BQD, and *Break-In*, the NZART Official Journal. As reported in my July column, the Raoul Island DXpedition took place in the second half of March this year and was successful from the radio and scientific points of view, but a disaster for the owner of the yacht *Shiner* used to transport the expedition to the Kermadec Islands.

Departure: Tuesday, March 13, 1984, at 11:30 am NZT, the group was aboard the yacht *Shiner* on their way to one of life's great adventures. Years of hard work by Ron ZL1AMO and months of departmental negotiations by Dr. John Craig, the leader of the scientific party, had finally paid off and they were on their way to the Kermadec Group of Islands, destination Raoul Island, ETA 5 days.

The Travelling Party: There were ten persons on board, five in the scientific party, four in the amateur party, and the Captain, John Taylor. The scientific party consisted of Dr. John Craig, expedition leader, who was to study both the native Kiore rat and the introduced Norwegian rat populations on the island; Anne Stewart, to study the native Tui bird population and compare their song and other characteristics with the New Zealand native Tui bird; Mark Vette, a great climber of trees, which was very much appreciated when antennae went up and down, whose main job was assisting both John and Anne in their studies (Mark is by trade a very capable scientist in animal behavior patterns); Dr. David Schiel, a marine biologist and an extremely good diver (he assisted when disaster struck the yacht); and Mike Kingsford, another marine biologist studying fish life and migration patterns from the northern Pacific down to New Zealand. For his investigations, Raoul Island is a very handy "half-way house" for the migration patterns.

The amateur-radio party consisted of Ron Wright ZL1AMO/ZL8AMO (and many other DX calls—the CW expert who worked approximately 10,000 QSOs); John Litten ZL1AAS/ZL8AAS, who mainly operated phone and stacked up about 5000 QSOs; Roly Runciman ZL1BQD/ZL8BQD, who operated both phone and CW on all bands, also working 10,000 QSOs; and Duane Ausherman W6REC/ZL0ADW/ZL0ADW/8, who operated both SSB and CW with slightly more emphasis on CW and did very well with 5000 QSOs for his first DXpedition.

Journey to Raoul: The journey-to-Raoul routine consisted of three hours on watch and six hours off for the five days. Time is measured by daylight and darkness rather than by the days of the week—every three hours another shift comes on and the one going off gets a quick bite to eat and then tumbles into bed.

One of the amazing occurrences during the voyage was seeing the small "Welcome Swallows" along with other bird life with land two or three hundred miles away in either direction. The scientific experts when asked, "Where do they go at night?", replied, "Oh, back home again; they can fly enormous distances, and they will be back here again tomorrow!" Then there were the dolphins riding our bow wave. . . and the spectacular sight of seeing the seas burst into green light with phosphorescence during the small hours of the morning watch. And there were the moths and butterflies three hundred miles from land; where do they come from?

Every hour the travelling log is read and entered into the ship's log, and every day we call up Auckland Radio and "home" to give positional reports and get the latest weather information.

After four days of nothing we sight the first island of the Kermadec Group, Esperance Rock. Later that day we passed between the next group of islands, Curtis Island, which is still an active volcano with quite a bit of steam escaping from the crater, and Cheesman Island, with an extinct volcano, covered with quite bushy vegetation and inhabited by bird life. Soon radio contact was made with Warrick ZL8AFH via Marine Channel 16, and we are told to lay off as close to the landing platform as we like. The great moment is at hand; we have arrived at Raoul Island!

Landing: Landing at Raoul is a very delicate task. There is no jetty or wharf. Goods and chattels have to be landed by being lifted from small boat to the landing platform by a manually operated crane using a cargo net. Mere humans have to clutch a ladder attached to the crane hook and hope that the crane operator knows what he's doing in the winch house! Judging the position of the ladder relative to the swells is quite a feat.

The small landing boat, *Chunder [Ed.—A down-under word meaning throw up]*, is well named and it, along with everything else, makes the journey up the cliff from the landing platform, "the flying fox," hauled by yet another manually operated winch, quite exciting.

Once at the top, there is conclusive proof that we are indeed on Raoul Island,

for we are confronted with a large notice with instructions "to prevent damage to the vegetation and the natural features of the island."

Our Temporary QTH: Raoul Island is quite a paradise in the South Pacific. It is still an active volcano with upwards of six earthquakes per day, most not felt by those on the island, though one or two heavier jolts reminded us of the continued activity. Most of the island is covered in Nikau palms as a type of undergrowth, with a canopy of beautiful Pohutukawa trees overhead. Along the northern coastline is a self-sufficient farm which supports the permanent residents on the island. The coastline is extremely rugged, with only a very small rocky beach along the western coast where the original settlers, the Bell family, used to live many years ago. There are still a few goats and many wild cats on the island, and, of course, lots of rats. Bird life is quite prevalent, with the song of the Tui making the bush come alive. The oranges from the orange grove have to be tasted to be believed, and delicious bananas grow freely as well.

The personnel on the island are a terrific band of fellows, and they treated the expeditioners very well during their stay, especially when the tragedy with the yacht occurred a few days after arrival. Mike (the officer in charge) took care of the landing formalities, passports, etc., and settled us into our quarters; Paul (Lands and Survey Department) was our island tour guide and was a tower of strength; Garth (Met Office) was the Raoul Island champion table-tennis player, who was deposed by Roly ZL8BQD. Garth is also the photographic expert in the group. Tom is the resident mechanic and an expert cook into the bargain; and Warrick ZL8AFH was the technician and radio operator. When the amateur DXpedition left the island, they left Warrick a triband beam and various assortments of wire and coax, so his signals on the higher frequencies should be better than they were before.

The Amateur DXpedition: Radio operation was the amateur highlight of the trip and, of course, one of the reasons for the expedition. Some 30,000 QSOs were made with all points of the globe, propagation being good on all bands at some time every day. Antennas were a 160/80m dipole, up about 80 feet between two very high Norfolk Pine trees, and two triband beams. Equipment used were the ICOM IC-745, IC-740, ICOM Auto Tuners, and the Kenwood TS-830 and TS-430.

The DXpedition again tried to cater to as many facets of the hobby as possible, especially QRP operation. For those stateside stations who stood by to enable the DXpedition to do this, they extend their grateful thanks. The best QRP was with N6HJ with 100 milliwatts, believe it or not, and many stateside stations gave the report, "I don't know how QRP I am, but nothing is moving here!" Great stuff fellows, hope we can do it again sometime from other Pacific DX locations.

One QSO that made a nice change was being called by BY1PK, an unusual switch that was appreciated by all. Also the operators would like to make special mention of Werner DM9KE and his net on 21.157 MHz; thanks Werner for getting so many of the Europeans through to make those valuable ZL8 QSOs.

Disaster Strikes: Life was quite exotic until March 21, three days into the operation, when Cyclone Cyril made its way down from Tonga and struck the island in the small hours of the morning amidst driving rain, total darkness, and driving seas. At 12:15 am the anchor ropes holding our yacht, *Shiner*, broke and allowed the boat to hole itself against the rocks in Boat Cove. Our Captain, John Taylor, and two of the scientists were on board at the time and had to abandon ship into their Avon landing craft amidst all the elements. They made their way to shore to a landing over very large and dangerous rocks. All they had to guide them was the light of two torches held by the shore party to show them a "channel." They were indeed fortunate to catch the right wave and surf over the rocks to make a scrambled, but safe, landing.

We were indeed fortunate no lives were lost. The boat was a total loss, including quite a bit of personal gear on board. Our hosts on the island together with the oceanographers from the scientific party did a terrific job salvaging what was possible from the wreck over the next two days. A bit of a damper to the expedition, but when it was known that no lives were lost, the radio operation could at least carry on with easier minds. Of course, they now had to find a way to make alternative arrangements for the trip back to New Zealand. After several different alternatives, they finally had to accept the offer of a diversion pick-up by the coastal freighter *MV Vila* en route from Tonga to Auckland. The cost of the diversion was $3,000, an added expense they had not counted on, but there was no choice.

So, after an uneventful trip home, apart from a little seasickness, the expeditioners arrived back in Auckland for a reunion with their families; so ended the trip of a lifetime to the rare and exotic Kermadec Islands.

BITS 'N' PIECES

One of the chores the members of the Kermadec expedition told us about was the baking of their own bread and the trouble they had keeping track of which loaves were the fresh ones. Amateur ingenuity and some food dye came through with the answer—color-coded bread, a great idea so long as someone remembered the color coding.

More 6m VHP news from Terry ZL2TPY indicated that April provided more surprises with every type of propagation taking place during the month: sporadic-E, F2, TEP (Class 1 and 2), Backscatter, and tropo, etc. His running total of 6m QSOs for the last four and half months has well passed the 1000 mark (nothing under 160 kms) with over 600 plus stations worked. The overseas DX within the Pacific Basin and the States continues with this month's total bringing up his total of call areas worked to 39 for the same period. The JA totals for the past summer season to April was 440 JAs, all 10 Districts, and 54 JA prefixes, so 6 was very much alive in the early part of this year.

Old-Timers Club news for the month included a 50-year Certificate to Honorary Member Mrs. Austine Henry VK3YL and 60-year Certificates to Frank Bell ZL4AA (ZL's first amateur) and Bern Spackman ZL1GV, ex Z2BM. Silent Keys recorded were Morrie Walker ZL1AU, ex ZL3FQ, Wally Wainwright ZL2IS, ex ZL2IE, and Clinton Way, ex ZL2JC, and Sydney Carpenter.

OTC Awards made at the annual meeting of the Club held during the NZART Conference recently were to Arthur Allen ZL1JQ, who is the Grand Old Man (President) for the 1984/85 year, and the Montgomery Cup, for the best contribution to *Break-In*, went to George Anderson ZL2JG, for his several contributions to *Break-In* during the past year.

NORWAY

Bjorn-Hugo Ark LA5YJ
N-3120 Andebu
Norway

Here we are again. I sincerely hope you all have had a pleasant vacation, nice weather, etc. I have had the pleasure to be able to join in on a couple of ham meetings, and I will today take you to the biggest ham festival in Europe, The HAM-84, at Friedrichshafen, southern Germany (or "Bodensee Treffen," which it's also called since Friedrichshafen lies on the shore of the Bodensee, facing the Swiss border).

We were three ham operators taking the ferry from Oslo to Kiel in northern Germany, and we drove the 1000 kms south to Friedrichshafen in one day. Henry LA3FI, the owner of Norsk Radio Supply, took care of the driving and Brynjar LA1AR and I took care of the mapping and sign reading. We never left the Autobahn except for refilling the car and the stomachs. LA3FI's Mercedes never got below the 100-km/h mark, and very often it was closer to 200 km/h. Certainly we did not see much of the landscape.

We came down to Friedrichshafen and had quite some problems in getting lodging, but managed after a while to get booked in at a couple of small hotels. Remember, when traveling in Germany, to take your own soap with you if you want to shower. We didn't remember, but a little organizing worked that out.

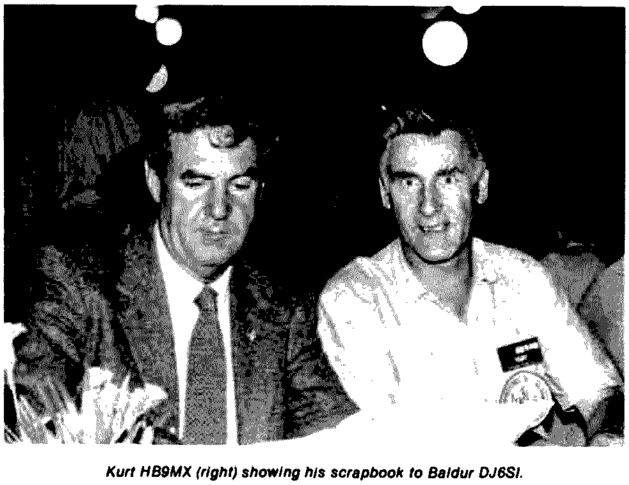
The very next day we had the pleasure to see the biggest and nicest place for a ham operator to see. Gee, man, even we who work in the business were amazed. And the flea market overflowed with all kinds of surplus and used gear. We spent some good times chatting with exhibitors from all over the world. We did have the great pleasure to meet Mr. Bob Cushman from the Cushcraft company and spent quite some time chatting about antennas. A very pleasant meeting indeed, both personally and business-wise.

Other exhibitors included, of course, Telex-Hy-Gain, and we did have a couple of nice chats there, too. There's only one drawback in dealing with US companies these days, the US dollar is so extremely expensive at this time. During the last six months it has gone up 16 percent, and that is very hard on amateurs. Raw materials have been raised 20 percent, and it's really a killer for business. But anyhow, we did enjoy the whole exhibition.

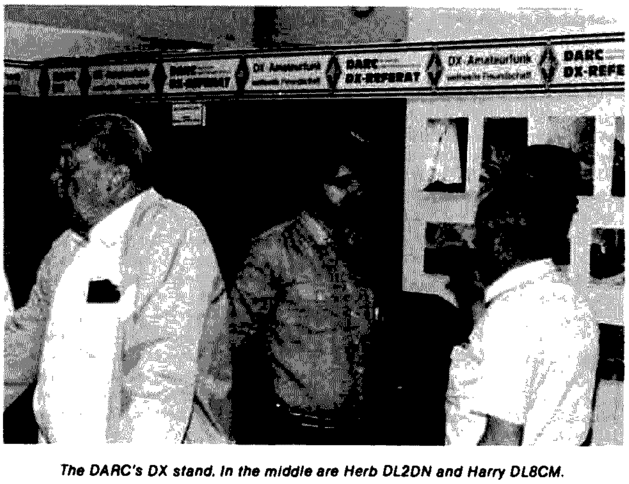
Later that evening we had the pleasure to join the ham party and had a very nice chat with Kurt HB9MX and Baldur DJ6SI. The latter is a very famous DXpeditioner who you certainly have worked from a few of those far-off rare DX countries.

We also met Bjorn SM6EHY, who immediately got fired up on low-band DXing. I will write about Bjorn in a later column. One thing that really surprised me was the generally friendly attitude shown by everyone to everyone. It was just a great pleasure to be a foreign visitor. As a DXer, I certainly got interested in the DARC's DX

Continued on page 100



Kurt HB9MX (right) showing his scrapbook to Baldur DJ6SI.



The DARC's DX stand. In the middle are Herb DL2DN and Harry DL8CM.

73 INTERNATIONAL

from page 94

stand and had nice chats with a few of the guys behind the stand.

We did, of course, take the opportunity to use the hospitality given by the combined representatives from the Post and Telegraph services in Austria, Switzerland, Lichtenstein, and Germany, who on the spot issued visiting licenses on a reciprocal basis without any fees at all. I personally had the opportunity to obtain LA5YJ/HB, LA5YJ/HB0, DL/LA5YJ, and the tongue-breaking OE1XFB/LA5YJ. Only the French representative was missing, and we were missing him.

As you may have gathered already, we did take a trip through Austria, Lichtenstein, Switzerland, France, and Germany, but unfortunately we did only bring a 2m FM rig this time, and I had the pleasure of chatting with amateurs from all of these QTHs except from France, where we couldn't obtain a license on such short notice. The only thing that took some pleasure off the trip was the weather. Maybe someone disliked the kind of rf I was transmitting through the air! It was raining like I have seen only in the tropics, and I'm sure that part of the world got enough rain to put the Sahara Desert under water during that day.

Everyone assured us that this was very unusual; normally the weather should be nice and sunny this time of the year. However, next time we're going to bring with us an HF rig and spend some time in each of the countries trying to create a few pileups. I'm sure the weather will be much better then. I will say that if you get the opportunity to go to Europe during the last part of June next year, take the chance and join in on the Bodensee-treffen 1985. You surely won't regret it. If interested, write to DARC-Deutscher Amateur-Radio Club e.V., 3507 Baunatal, Lindenalle 6, Germany. The affair is absolutely one of the best I have attended, and remember, it's only for ham radio.

BJARNE ERIKSEN LA4HF

I would like to present to you another DXer from Norway, one of those you never hear too much from or about, which does not mean that he is not one of the big ones. Just the contrary. Depending on what you consider as a "Big Gun"—one with a big antenna farm, big equipment, or the capability to get the rare ones—Bjarne P. Eriksen LA4HF, from Likollen, near Oslo, belongs to the last category. He was born in the southern part of northern Norway in 1928, and will soon be 56. He was first licensed in 1955 and was really bit by the bug when he worked his first real rare one in 1958, VK0TC, on 15-meter AM. Since then it seems that his interest in DXing has just increased, though it has never taken control over his life and work.

Bjarne lives with his wife, Liv, in a one-story house in a suburb of Oslo. Around 20 km from the inner city, nothing except the 12-meter-high tower with a Classic 33 from Mosley can pick him out as being any different from all the other people living around there. He also has a multiband trap dipole for local 80- and 40-meter work, since he never has taken any interest in low-band DXing.

His equipment has been for many years a Yaesu FT-500, but last year he realized that the rig was starting to get a bit too old, and he traded it in for a brand new Yaesu rig, the FT-980 CAT. You can imagine his happiness about this rig. Even though he thought quite well about the old one, which had served him well for so many years, his answer to my question the other night, if he would like to switch back was rather short and precise: No way! And you know, the new toy got the flame burning a little higher. He is really sincere about his hobby, and it relaxes him from his work as a Managing Director at E. Stephesen AS, in Oslo—a firm specializing in hearing aids.

When I was visiting him I tried hard to move him into buying a new tower and a bigger antenna, but he was concerned about his neighbors. The idea is not new to him, however; I think time will tell!

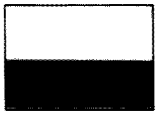
Bjarne has managed to work 304/318 and is still waiting to work such easy goodies as 4U1UN, ZL/Chatham, XF4, and BY. I know that Bjarne would be very happy if anyone working from those locations could give him a hint about when they will be active. In addition to his FT-980, he has an SB-230 linear, Amtor MkII from ICS electronics, and a BBC model B computer.

LA4HF has other interests as well. He loves traveling and is starting to be a little globe-trotter. He has been visiting HS, CN, 3V8, SV5, and 5Z4 and is planning to pay a longer visit to HB9 this summer. He also is very interested in salt-water fishing and is very happy to pull up a couple of big cod.

Bjarne is very happy to spend time chatting with people and does not mind ragchewing at all, but a new one gets him always on the tense side, so to speak. Understandable, and I sincerely wish him luck towards the DXCC Honor Roll, where I, personally, think he belongs.

In another column I will present to you Bjorn SM6EHY of Sweden and another ham meeting we have been to.

Take good care, my friends; see you soon.



POLAND

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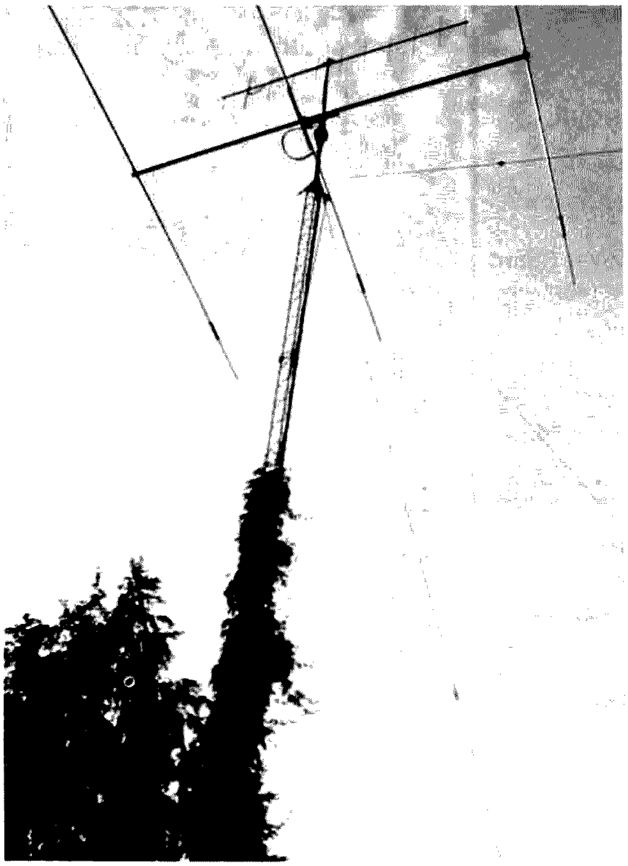
Poland

On January 28, 1984, the plenary session of Headquarters of PRAA (Polish Radio Amateurs Association) took place in Warsaw. Important resolutions that will exert an influence on the future activity of Polish hams were adopted. The PRAA electoral campaign began in February. Elections of delegates to district conventions were to take place at electoral meetings of radio-amateur clubs from February 1 to March 31. The district conventions elect deputies to the National Congress of PRAA in October or November. All



LA4HF's antenna farm. The wild climbing plant adds an unusual touch.

Bjarne LA4HF in front of his operating desk.

LA4HF's QTH during Christmas season.

Director C. C. Lee of Post and Telecommunications with Mr. Shozo Hara, Deputy Director Shih, and Tim Chen. (Photo by BV2A)

DXFF members. Second and fourth from the left, front row, are old-timers. (Photo by BV2A)

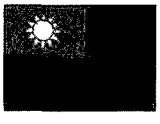
holders of valid licenses may have a share in the district conventions as ordinary members; on the other hand, persons who are bringing their licenses up to date may take part in them as "extraordinary members" if they are elected by a club. One deputy to the National Congress is to be elected for every 20 ordinary delegates to district conventions. Candidates elected by simply majorities are to be deputies; the number of deputies from each district depends on the number of members at the district conventions.

The Presidium of PRAA hopes that more former radio amateurs will resume their activities. The pity is that so many ex-hams do not apply for licenses. The spirit is willing but the flesh is weak? Some radio fans did not regain their licenses. They appealed to verification boards and in some instances received their longed-for papers. To encourage indifferent hams, the time for bringing licenses up to date has been extended for three months.

Considering the reduced number of radio amateurs, the Headquarters of PRAA made a decision to propose the liquidation of the functions of agents in some districts of Poland. The former agents are to hand over documents to other appropriate District Departments of PRAA. The District Departments of PRAA are authorized to commission the former agents to continue their functions or to designate others. From February 1, the radio amateurs of districts Bielsko Podlaskie, Chelm, and Zamosc belong to the district of Lublin; the radio amateurs of districts Ciechanow and Plock go to the district of Warsaw; Przemysl goes to Rzeszow; Slupsk to Koszalin; Walbrzych to Wroclaw; Wloclawek to Bydgoszcz; and Tarnobrzeg and Radom to Kielce. These organizational changes are to render the administration of PRAA more efficient.

Norms for staffing of PRAA are exceeded, the Presidium says. Salaried workers should be replaced by active hams.

At the request of the vice-president of PRAA Headquarters, SP3AUZ (the Polish Radio Videography Club) was founded on January 28, this year.



TAIWAN

Tim Chen BV2A/BV2B
PO Box 30-547
Taipei, Taiwan
Republic of China

After decades of endeavor, we are pleased to see that the Chinese government has decided to renew the licensing system with a ceiling of 12 ham stations to be distributed in 4 districts. The northern district will be allotted 4 stations, central 3, southern 3, and eastern, 2. We anticipate many license applicants, and the limit of 12 stations will not meet the demand. To solve this problem, club stations will mostly be the way to absorb more operators at the beginning.

The regulations governing ham-radio stations are under revision. The usable frequencies allowed will be only on the 40-, 20-, 15-, and 10-meter bands. The China Radio Association (CRA) is requesting the authority to add the 80-meter band for ham use in order to facilitate 5-band QSO possibilities. VHF and UHF are still out of the question. However, 144/430 were recently used by the Japan DXFF DXpedition on a temporary basis, so it is possible we can apply for them in like situations.

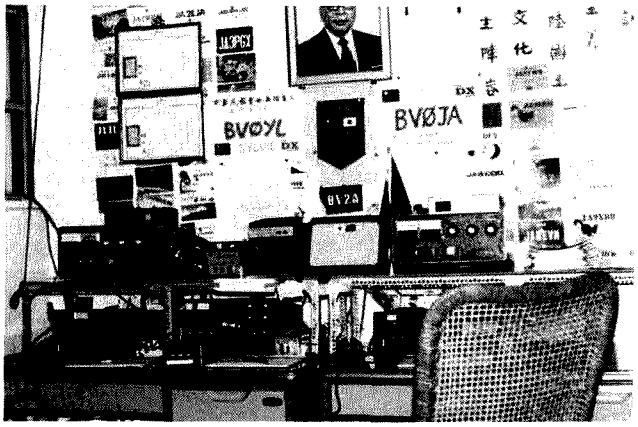
The Directorate General of Telecommunications (DGT) will give public examinations once or twice in a year. The first examination was scheduled for September. All participants have to pass the qualification test. It covers Morse code at 30 wpm on both sending and receiving for 3 minutes, radio principles, electricity principles, telecommunications law, international radio regulations relevant to amateur radio, English, and communications geography. Oral tests on alphabetical and numeral spellings are also required.

DXFF DXPEDITION

The Japan DXFF DXpedition group consisted of 12 members, including two XYLs and one reporter/photographer. They were divided into three teams and arrived on June 8, 13, and 14, respectively. As usual, the ham visitors wasted no time setting up station BVØJA/BVØYL and antennas immediately after their arrival in Taipei. The DXpedition venue was at the same place which had been used by former groups. It is facing a public park, with a spacious roof on a 12-story building for antenna installation good towards east, north, and west.

The special callsigns BVØJA and BVØYL were assigned for use by the OMs and YLs of the group. By estimate, over 15,000 QSOs were made during the 10-day operation. The most outstanding aspect of the DXFF group was the operation on 144/430 with AO-10 (B), from which nearly 200 QSOs (CW/phone) covering 4 continents (excepting South Africa and South America) were obtained. It is a record for ham operation with satellites in this area. We have informed the DXCC of these operations and callsigns which had been approved by the Chinese Government and considered legal for DX credits.

Shozo Hara JA1AN, president of JARL,



DXpedition station BVØJA/BVØYL.

recently made a courtesy call on C. C. Lee, Director of Post and Telecommunications, MOC. Their talk about world amateurs was fruitful and meaningful in promoting ham activities in our country. Therefore, further cooperation between JARL and CRA is expected. A second Japanese group was to visit BV-land in July, and the callsign BVØAB was requested for the mission.

After expedition activities, our visitors' stations had materially improved QSOs to world hams; we should be very appreciative of their efforts as they spent lots of time and money to carry out their missions. Perhaps there will be two bigger groups scheduling arrivals this fall; please look out for them.

Local authorities have so far approved four expedition groups from abroad; we are going to strengthen the ham movement gradually, although we do not have many stations at present.

There is no doubt that ham activities have become popularized step by step in this land. Enquiries by letters and phone calls are frequently received. Newspapers and the broadcast media are quite encouraging, giving us good comments. Furthermore, one of local TV stations, the CTS, had a vivid telecasting of our activity in its news program on prime time. Its lady reporter, Miss Lee, said, "Now I am also tempted by the hobby!" HI YL! Welcome to amateur radio!

"Why not have a telephony class?" asked Dr. Wayne Green W2NSD during his sojourn in Taipei with his XYL, Sherry, recently. (Congratulations, Dr. Green, for your new title.) You should be also pleased to learn that we are stepping forward, but we have to stick on CW/phone at the beginning. Thanks for your concern!

✓ See List of Advertisers on page 88

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PROPAGATION

Jim Gray W1XU
73 Staff

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20						20					15
ARGENTINA	20	40A	20	40					10		20A	20A
AUSTRALIA	20	40A		40	40	20	20	20		20	15	15
CANAL ZONE	40A	40A	40	40	40		20	20A	10	15A	20A	20
ENGLAND	40	40	40	40				15	20A	20		
HAWAII	20	20				20	20			15	15	15
INDIA						20	20	20				
JAPAN	20					40	20				15	15
MEXICO	40A	40A	40	40	40		20	20A	10	15A	20A	20
PHILIPPINES							20					
PUERTO RICO	40A	40A	40	40	40	20	20A	15A	15A	20A	20	40A
SOUTH AFRICA	40	40A	20					15A	15A	20A	20A	20A
U. S. S. R.	20	20					20	15			20	20
WEST COAST	21A	20	40	40	40	40	40	20	15	15A	15A	15A

CENTRAL UNITED STATES TO:

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AUSTRALIA					40	40	20	20	20		15	15
CANAL ZONE	40	40	40	40	40	20	20	15	15A	15A	15A	15
ENGLAND	40	40	40	40				15	15	20A	20	20
HAWAII	20	20	20	40	40		20	20		10	10	15
INDIA	20	20					20	20				
JAPAN	20					40	20	20				15
MEXICO	40	40	40	40	40	20	20	20	20	15A	15A	15
PHILIPPINES	20A	20					20	20			15	15
PUERTO RICO	40	40	40	40	40	20	20	20	20	15A	15A	15
SOUTH AFRICA							10	15A	15	20A	20A	20
U. S. S. R.							20	20A	15	20	20	

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20A	20A	20			40	40	40A	20	20	20	20A
ARGENTINA	20A	20	40A	40						15A	15A	15A
AUSTRALIA	20A	20A	20	20	40	40	40		20	20	15	15
CANAL ZONE	20	20	40A	40A	40			20	20A	15A	15A	15A
ENGLAND			40					20	15	20A	20	20
HAWAII	15	20A	20A	40A	40	40	40	20	20	20		15A
INDIA	20A	20A						20	20			
JAPAN	20A	20A	20			40	40	40A	20	20	20	20A
MEXICO	20	20	40A	40A	40			20	20A	15A	15A	15A
PHILIPPINES	15			20		40	40		20	20		
PUERTO RICO	20	20	40A	40A	40			20	20A	15A	15A	15A
SOUTH AFRICA	20							20	20	15	20	20
U. S. S. R.			40	40				20A	15A	10	20	20
EAST COAST	15A	20	40	40	40	40	40	20	15	15A	15A	15A

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

G = Good, F = Fair, P = Poor.

NOVEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
				1 G	2 G	3 G
4 G	5 F	6 F	7 G	8 G/F	9 F/P	10 P
11 F	12 F	13 G	14 G	15 G	16 G	17 G
18 F	19 F	20 F	21 F	22 G	23 G/F	24 F
25 F	26 P	27 P	28 P/F	29 G	30 G	

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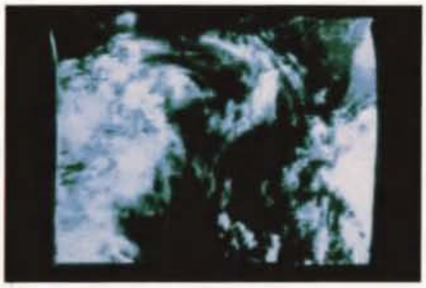
BVØAB—84

Happy Holidays!

Paraty Link—57



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FCC 3, Hams Won

"I HAVE A SUSPICION that we're not going to lose this band, but that doesn't mean that ham radio is out of the woods," says **Art Rels K9XI.** Art, who is the editor of *220 Notes*, believes that hams have won this battle, although he cautions that further attacks on the 220-MHz spectrum allocation are likely. Incredibly, hams are buying 220 gear by the bushel. Part of the reason is the increasing popularity of digital modes of communication, like packet radio, which use the band for high-speed inter-group linking. The FCC received nearly 300 comments on the issue; most were rational discussions of the impact land-mobile radio would have on 220. This is in contrast to the deluge of unsupported whining the Commission had to wade through during the no-code disaster. According to Art, ". . . the future of 220 MHz is looking up!"

Packet Ears

SPEAKING OF PACKET RADIO, the ARRL is publishing a very informative newsletter for the packeteer, dubbed *Gateway*. It's available to everyone with an interest in the subject, although League members get a discount on the subscription rate. The second issue of *Gateway* described an HF packet bulletin board run by **Hank WØRLI.** Hank's BBS is one of the more popular systems on the east coast and can be accessed on 14.080 MHz using 200-Hz shift at 300 baud. If you would like more information about *Gateway* and packet radio, drop Editor **Jeff Ward K8KA** a note at 225 Main Street, Newington CT 06111. Tell him *73* sent you!

Ducky Wars!

NOW THAT NO-CODE is dead, it's time for a new divide-the-ranks issue: a national 144-MHz repeater standard. Right now we have two. Under the eastern plan, repeaters in the 146-148-MHz subband are spaced 15 kHz apart. The bandplan being used in the western part of the country has them 20 kHz apart. Obviously, this creates real nightmares for repeater coordinators in areas where both systems abut. Who's correct? Rumor has it that Mexico will be using the 20-kHz system (by governmental decree) very soon. Hams in states that border XE-land are going to have mucho problemos when they try to kerchunk their favorite machine—unless they switch their repeaters to 20-kHz spacing. But then what about the hams in states that border the states that border XE-land? You can easily see how the trouble quickly spreads across the nation. It gets really confusing when you realize that the ARRL promotes its own bandplan—repeaters west of the Mississippi are supposed to run inverted. Personally, I think we should implement a national 20-kHz-spacing system. Technically, it makes more sense than what we're doing now. What do you think?

73's Company

DID YOU EVER NOTICE that company is most likely to drop by when the place is a wreck? Well, it happened to us here at *73* a few days ago. It was a fine New Hampshire Friday, and everything we own was in boxes. The furniture was all shoved into one room, and the entire staff was decked out in our finest grubby attire, as we were moving to plush new offices about a mile down the road. Into the middle of this mess stepped **Grant W6NTK,** his family, friends, and two dogs! Grant had driven his RV from California to Maine and wanted to drop in and say hello. We had a very pleasant visit, with Grant demonstrating his allband mobile installation (including RTTY) which was very impressive. Not ten minutes after wishing Grant farewell, we heard a knock on the door . . . it was **Dean WT4A,** who had driven up from Florida! Needless to say, we didn't get a heck of a lot of moving done that afternoon.

Going, Going . . .

WILL HAMS LOSE still more spectrum to commercial interests? The FCC would like to reallocate half of our 160-meter band to non-government radiolocation. Docket 84-874 would move this service to make room for an expansion of the AM broadcast band implemented in the 1979 WARC. Though the amateur community was taken by surprise, the ARRL moved quickly, filing a motion against the NPRM just three days after it was announced.

Author! Author!

FAME AND FORTUNE are what *73* authors receive! We all have a story to tell. Why not tell it to the world? We are looking for articles that deal with the technical side of amateur radio. The how-to-build-it-and-why-does-it-work type of piece that you enjoy reading in *73* every month. It doesn't have to be complete plans for a 9600-baud frequency-agile kilowatt hand-held, just some little gadget that you or a friend have built. I won't tell you how much we pay for articles, but if we really like it, a well-written manuscript could pay for that new packet system you've had your eye on. And don't worry if you can't spell or if your paragraphs are one long sentence. We'll help you over the rough spots. Interested? Send an SASE to *73*, 80 Pine Street, Peterborough NH 03458, Attn: HTW. When your envelope comes back, it will have a copy of our author's guide in it.

Cheap Tricks

YAESU FT-757 OWNERS rejoice! From our something-for-nothing department comes word of a newsletter published by the **757 Club International.** It really looks like a great source of information about this popular rig, and the price is right. Membership in the club, which includes the newsletter, is free—just send a large SASE to 757 Club International, Box 5021-E, Spring Hill FL 33526.

Read This!

WHAT'S NEW WITH YOU? We would like to know just that. You may have noticed (especially if you're reading this) that *73* has a new column. "QRX" is about you—what you are doing, what you've heard, what you would like to do. Don't be shy: Send news items, comments, and what have you to *73* Magazine, 80 Pine Street, Peterborough NH 03458, Attn: QRX Editor. Try to double-space any typed items, and send along a picture if you can.

China Syndrome

WORKED CHINA YET? Neither have I, but there's hope for us little pistols. According to **Tim Chen BV2A/BV2B** in Taipei, exams for ham operators will be given by the Ministry of Telecommunications, and we may expect oodles of BY calls flooding the bands very soon. OK, maybe not flooding, but at least it will be a little easier to get that card you've been wanting. In the meantime, look for BY1PK around 14.155 MHz and between 14.180 and 14.190 MHz at 1400 and 1600 UTC. BY5RA has been heard near 14.195 MHz from 0800 to 1000 UTC.

Fight Back!

THE ARRL HAS FILED a Request for Issuance of Declaratory Ruling with the FCC that asks the Commission to exercise preemptive authority over state and local zoning regulations which affect transmitters and antennas used in the Amateur Radio Service. File formal comments (an original and four copies) with the Secretary, FCC, 1919 M Street NW, Washington DC 20554; refer to PRB-1. The deadline for comments is December 14, 1984.

Robin Rumbolt WA4TEM
1134 Clade Hill Drive
Knoxville TN 37919

A Times Square Data Display

Build this scrolling touchtone decoder for your favorite repeater. What you see is what you hear.

This is a project for repeater operators and people who want to see what they hear on repeaters, namely, touchtones™. It is a Times-Square-style scrolling touchtone data display. It is also a project that I wanted but kept putting off for all of the 12 years that I have been designing and building autopatches and touchtone repeater controllers. I could never justify dedicating a touchtone decoder to a function like this. Touchtone decoders were just too expensive, finicky, or bulky.

Well, things have changed! With its recent introduction of the TRK-956 DTMF (touchtone) decoder kit, Teltone Co. of Kirkland, Washington, will surely put a severe crimp in the 567 tone-decoder business. Priced at only $22.75, the TRK-956 comes complete with an M-956 single-chip DTMF decoder, a 3.58-MHz crystal, and a 22-pin IC socket.

The M-956 decoder is a CMOS chip that includes all filters, decoders, and timing circuits needed to implement a complete 16-digit DTMF decoder. Its block diagram is shown in Fig. 1. The decoder requires only a single +5-volt supply and has a measly current drain of only about 10 mA! By the way, Teltone includes with each kit sold their SC-1 application guide which explains all about telephone lines and signaling standards and has plenty of touchtone applications circuits.

Features

This circuit will display incoming touchtone digits beginning on the right side of the display and scrolling them to the left as new digits are received. The circuit shown in this article is capable of displaying 16 digits.

The circuit has several display-control buttons. A CLEAR button blanks the display and reinitializes memory. The SHIFT button will shift the entire display to the left one place and insert a blank character on the right end. A MATCH button is used for sequence programming (which will be explained later).

A useful feature that I included was that of code matching. A given sequence of numbers ranging in length from 1 to 16 digits may be programmed easily into the unit. Then anytime that exact sequence of numbers is received, the circuit will activate an alarm line. This feature is very handy for several purposes. For example, it can be used to dump an autopatch when an illegal phone number is dialed, or it can be used to set off alarm bells and sirens when a malfunction code is received on a telemetry downlink, or it can be used to unsquelch a station's speaker when an access code is received. I am sure you can think of many other uses.

The Circuit

When I started to design this circuit, I came to realize that a standard shift-register design would require at least 21 integrated circuits. That's a lot more wiring than I wanted to do. Since I am an advocate of the KISS design philosophy (Keep It Simple, Stupid!), I decided to utilize the marvelous power of the microprocessor to simplify. Using the Intel 8748 microprocessor, I

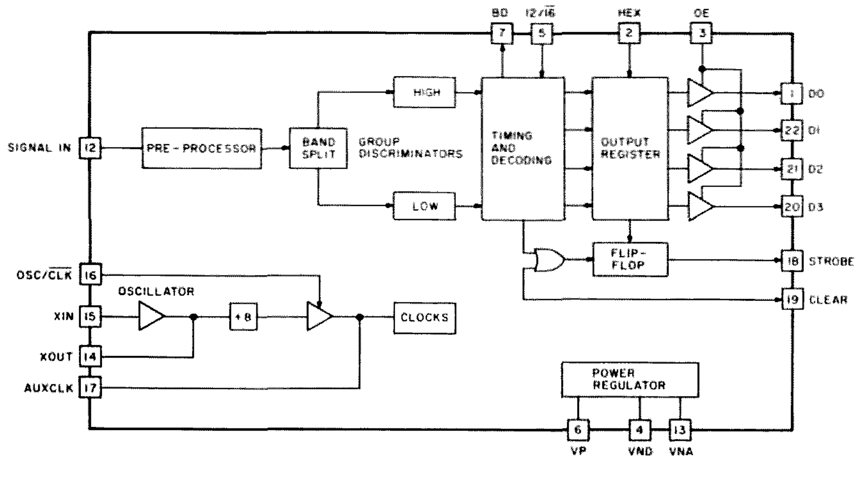


Fig. 1. Block diagram of the M-956.

was able to bring the circuit down to just four ICs, which is just about right for two evenings' construction time. The schematic is shown in Fig. 2.

The 8748 microprocessor, or course, controls it all. It receives the binary data from the decoder, transforms the data into 7-segment form, and then routes the proper display data to the segment drivers at the same time that it activates the appropriate digit driver. Every time a new digit is received, the microprocessor checks the currently displayed data to see if it matches a preprogrammed sequence that may have been stored in memory previously. If there is a match, the alarm line is set to a high state. The microprocessor also reads the switch inputs to check for any incoming commands. It does all this many times per second, so quickly in fact that it has no trouble keeping up with the fastest autodialers (about 16 digits per second).

I chose the 8748 for the job because it has all the ROM, RAM, and I/O capability needed on a single chip. I also had one in the junk box! Hi! I realize that not everyone has capabilities for programming EPROM-style microprocessors, so I will offer preprogrammed units at a reasonable price.

In addition to the microprocessor and the tone decoder IC, I used a CD4515 CMOS 4-to-16-line decoder to expand the output capability of the microprocessor. This IC has the capability of driving 16 output lines. These lines then go to discrete transistor digit drivers (Q1–Q12) which supply current to each display digit at the proper time. The microprocessor itself drives the 7-segment driver transistors (Q13–Q19).

Software

Since I am using the same

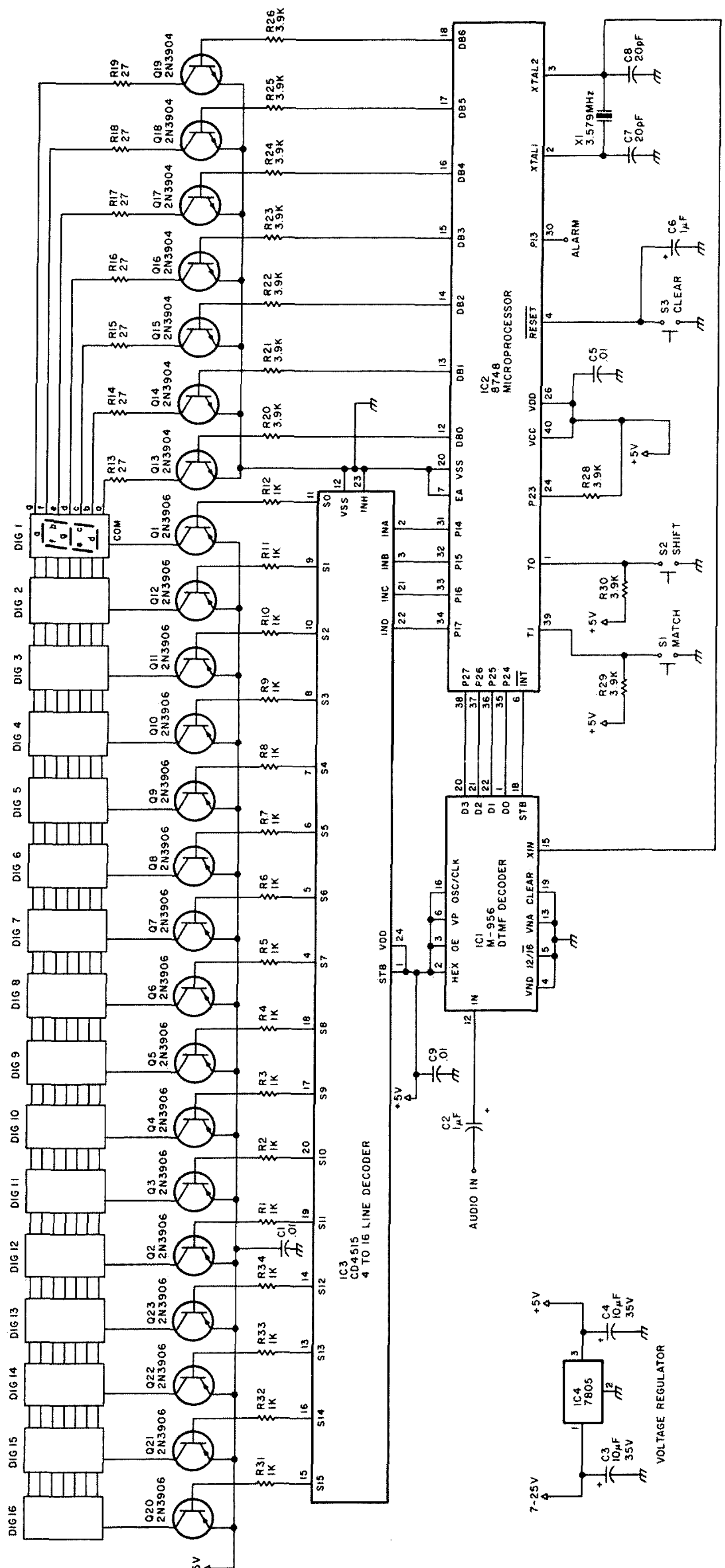


Fig. 2. Schematic diagram.

microprocessor for data display and telemetry transmission, I started the program (below) with a fast check to see if transmit or receive mode was selected. This is indicated by a high or a low on pin 24 of the microprocessor. If the input is low, the transmit routine is selected. Otherwise the program for data display will be executed. The program then initializes registers and memory space. Anytime the CLEAR button is pressed, the microprocessor will reset and re-execute this initialization sequence, thus clearing the display and memory.

Lines 180 through 270 comprise the main loop. Everything else is in subroutines. The main loop calls the display routine, DAGN, checks to see if all digits have been displayed, and then checks the INT input to see if there is a new digit incoming. In this way, new digits are read in only at the end of a display multiplex cycle. This is done to minimize display flicker and keep each digit at equal brightness. The command switches are then checked. If no commands are incoming, then the program just executes the main loop again.

The SHIFT subroutine, lines 280–520, shifts all data down one location in memory when either a new digit is received or the SHIFT button is pressed. A new digit is stored in the now vacant first memory location. If the SHIFT button was pressed, a blank is put in the first memory location.

The digit-display subroutine, DAGN (lines 580–790), pulls the digit to be displayed out of memory, looks up its 7-segment representation in the decode table (lines 1090–1250), and then outputs the digit address and the proper 7-segment code. Since the * and # figures cannot be displayed on a 7-segment display, I replaced them by the "o" and "-" characters, respectively. I also chose to display the sixteenth digit, "D" on most pads, as blank. Imbedded in the DAGN sub-

Program listing.

```
0000              0010 ***** TOUCHTONE DATA DISPLAY ROUTINE *****
0000              0020 **** BY ROBIN RUMBOLT  HA4TEN 3/28/83 ****
0000              0030        ORG   0
0000 15           0040 START  DIS   I          ; CHECKS FOR TRANSMIT SELECT
0001 0A           0050        IN    A,P2
0002 53 08        0060        ANL   A,008H
0004 C6 AD        0070        JZ    XMIT
0006 27           0080 C1     CLR   A          ; INITIALIZATION ROUTINE
0007 AC           0090        MOV   R4,A       ;ZEROES & PRE-LOADS REGISTERS
0008 B8 20        0100        MOV   R0,020H    ;AND PORTS
000A B9 20        0110        MOV   R1,020H
000C A0           0120 C2     MOV   @R0,A
000D 18           0130        INC   R0
000E E9 0C        0140        DJNZ  R1,C2
0010 02           0150        OUTL  BUS,A
0011 39           0160        OUTL  P1,A
0012 0B 2F        0170        MOV   R3,02FH
0014 14 55        0180 STRT   CALL  DAGN       ;MAIN LOOP - CALLS DISPLAY ROUTINE
0016 FB           0190        MOV   A,R3       ;AND READS DECODER AND SWITCHES
0017 03 C1        0200        ADD   A,00C1H
0019 96 21        0210        JNZ   STRT2
001B BB 2F        0220        MOV   R3,02FH
001D 86 21        0230        JNI   STRT2
001F 14 27        0240        CALL  SHIFT
0021 26 4E        0250 STRT2  JNT0  PSHFT
0023 46 73        0260        JNT1  HOLD
0025 04 14        0270        JMP   STRT
0027 B8 3E        0280 SHIFT  MOV   R0,03EH    ;THIS ROUTINE READS THE DECODER
0029 B9 3F        0290        MOV   R1,03FH    ;AND SHIFTS ALL DIGITS LEFT ONE PLACE
002B BA 0F        0300        MOV   R2,00FH
002D F0           0310 LJI    MOV   A,@R0
002E A1           0320        MOV   @R1,A
002F C8           0330        DEC   R0
0030 C9           0340        DEC   R1
0031 EA 2D        0350        DJNZ  R2,LJI
0033 27           0360        CLR   A
0034 76 3B        0370        JF1   SI
0036 1C           0380        INC   R4
0037 0A           0390        IN    A,P2
0038 53 F0        0400        ANL   A,00F0H
003A 47           0410        SWAP  A
003B A1           0420 SI     MOV   @R1,A
003C B6 93        0430        JF0   CHECK
003E 14 55        0440 KGO    CALL  DAGN
0040 FB           0450        MOV   A,R3
0041 03 C1        0460        ADD   A,00C1H
0043 96 47        0470        JNZ   STRT3
0045 BB 2F        0480        MOV   R3,02FH
0047 26 3E        0490 STRT3  JNT0  KGO
0049 86 4D        0500        JNI   ERE
004B 04 3E        0510        JMP   KGO
004D 93           0520 ERE    RETR
004E A5           0530 PSHFT  CLR   F1         ;THIS ROUTINE RESPONDS TO SHIFT BUTTON
004F B5           0540        CPL   F1
0050 14 27        0550        CALL  SHIFT
0052 A5           0560        CLR   F1
0053 04 14        0570        JMP   STRT
0055 1B           0580 DAGN   INC   R3         ; MULTIPLEXES DISPLAY ONE DIGIT EACH
0056 FB           0590        MOV   A,R3       ;TIME IT IS CALLED
0057 98 00        0591        ANL   BUS,00H
0059 53 0F        0600        ANL   A,00FH
005B 47           0610        SWAP  A
005C AE           0620        MOV   R6,A
005D 09           0630        IN    A,P1
005E 53 0F        0640        ANL   A,00FH
0060 4E           0650        ORL   A,R6
0061 39           0660        OUTL  P1,A
0062 FB           0670        MOV   A,R3
0063 A8           0680        MOV   R0,A
0064 F0           0690        MOV   A,@R0
0065 03 F0        0700        ADD   A,00F0H
0067 A3           0710        MOVP  A,@A
0068 02           0720        OUTL  BUS,A
0069 23 F9        0730 OUT1   MOV   A,00F9H
006B 62           0740        MOV   T,A
006C 55           0750        STRT  T
006D 16 71        0760 IN     JTF   OUT2
006F 04 6D        0770        JMP   IN
0071 65           0780 OUT2   STOP  T
0072 93           0790        RETR
0073 B8 20        0800 HOLD   MOV   R0,020H    ;FREEZES NUMBER INTO MEMORY WHEN
0075 B9 30        0810        MOV   R1,030H    ;MATCH BUTTON IS PRESSED
0077 FC           0820        MOV   A,R4
0078 C6 91        0830        JZ    FINIS
007A AF           0840        MOV   R7,A
007B AD           0850        MOV   R5,A
007C F1           0860 LOOP   MOV   A,@R1
007D A0           0870        MOV   @R0,A
007E 19           0880        INC   R1
007F 18           0890        INC   R0
0080 ED 7C        0900        DJNZ  R5,LOOP
0082 85           0910 WT     CLR   F0
0083 95           0920        CPL   F0
0084 56 91        0930        JT1   FINIS
0086 14 55        0940        CALL  DAGN
0088 FB           0950        MOV   A,R3
0089 03 C1        0960        ADD   A,00C1H
008B 96 82        0970        JNZ   WT
008D BB 2F        0980        MOV   R3,02FH
008F 04 82        0990        JMP   WT
0091 04 14        1000 FINIS  JMP   STRT
0093 B8 20        1010 CHECK  MOV   R0,020H    ;CHECKS CURRENTLY DISPLAYED NUMBER
0095 B9 30        1020        MOV   R1,030H    ;AGAINST NUMBER IN MEMORY. SETS
0097 FF           1030        MOV   A,R7       ;ALARM BIT WHEN MATCH IS FOUND.
0098 C6 A9        1040        JZ    EXIT
009A AD           1050        MOV   R5,A
009B F1           1060 LOOP2  MOV   A,@R1
009C 37           1070        CPL   A
009D 17           1080        INC   A
009E 60           1090        ADD   A,@R0
009F 96 A9        1100        JNZ   EXIT
00A1 18           1110        INC   R0
00A2 19           1120        INC   R1
00A3 ED 9B        1130        DJNZ  R5,LOOP2
00A5 89 08        1140        ORL   P1,008H
00A7 04 3E        1150        JMP   KGO
00A9 99 F0        1160 EXIT   ANL   P1,00F0H
00AB 04 3E        1170        JMP   KGO
00AD 24 00        1180 XMIT   JMP   0100H
00AF              1190        ORG   0F0H       ;HEX TO 7 SEG. DECODE TABLE
00F0 00           1200        DB    00H        ;"D"  DISPLAYED AS A BLANK
00F1 06           1210        DB    06H        ;"1"
00F2 5B           1220        DB    5BH        ;"2"
00F3 4F           1230        DB    4FH        ;"3"
00F4 66           1240        DB    66H        ;"4"
00F5 6D           1250        DB    6DH        ;"5"
00F6 7D           1260        DB    7DH        ;"6"
00F7 07           1270        DB    07H        ;"7"
00F8 7F           1280        DB    7FH        ;"8"
00F9 6F           1290        DB    6FH        ;"9"
00FA 3F           1300        DB    3FH        ;"0"
00FB 5C           1310        DB    5CH        ;"*" DISPLAYED AS SMALL "O"
00FC 40           1320        DB    40H        ;"#" DISPLAYED AS "-"
00FD 77           1330        DB    77H        ;"A"
00FE 7C           1340        DB    7CH        ;"B"
00FF 39           1350        DB    39H        ;"C"
0100              1351 *
```

Program Memory

000-013 Initialization routine
014-026 Main loop routine
027-04D SHIFT subroutine
04E-054 Button shift routine
055-072 DISPLAY DIGIT subroutine
073-091 HOLD subroutine
092-0AC CHECK subroutine
0AD-0AE XMIT VECTOR
0AF-0EF Unused
0F0-0FF Seven-segment decode table
100-3FF Unused

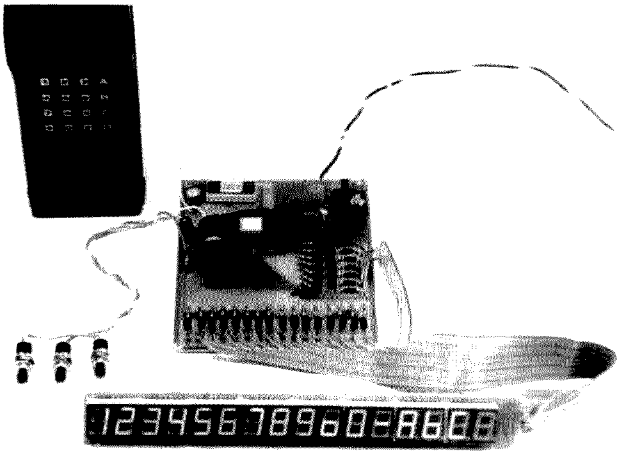
Data Memory

00-07 Register Bank 0 (R0-R7)
08-17 Stack
18-1F Register Bank 1 (Unused)
20-2F MATCH sequence storage
30-3F Display digit storage

Register Usage

R0 = General use
R1 = General use
R2 = Loop counter
R3 = Display memory address pointer
R4 = Sequence length counter
R5 = Loop counter
R6 = General use
R7 = MATCH sequence length storage

Fig. 3. Memory-usage chart.



The touchtone data display.

routine is a small delay routine, lines 730-780, which is used to slow down the multiplex rate. Too fast a rate limits digit brightness, while too slow a rate would cause noticeable flicker.

The HOLD subroutine, lines 800-1000, moves whatever numbers are currently on the display into sequence memory when the MATCH button is pressed. It also sets a flag, F0, which tells the program to check the display digits against this memory for a sequence match anytime a new digit is received.

The last routine, CHECK (lines 1010-1180), does the actual comparison of display data and memory data. If a match is found, the alarm bit is set. Otherwise the alarm bit is cleared. Fig. 3 shows a memory-usage chart.

Construction and Operation

A printed circuit board was developed for this circuit and is shown in Fig. 4. Fig. 5 shows the parts placement. Note that the circuit board does not include the display LEDs themselves. Because of the wide variety

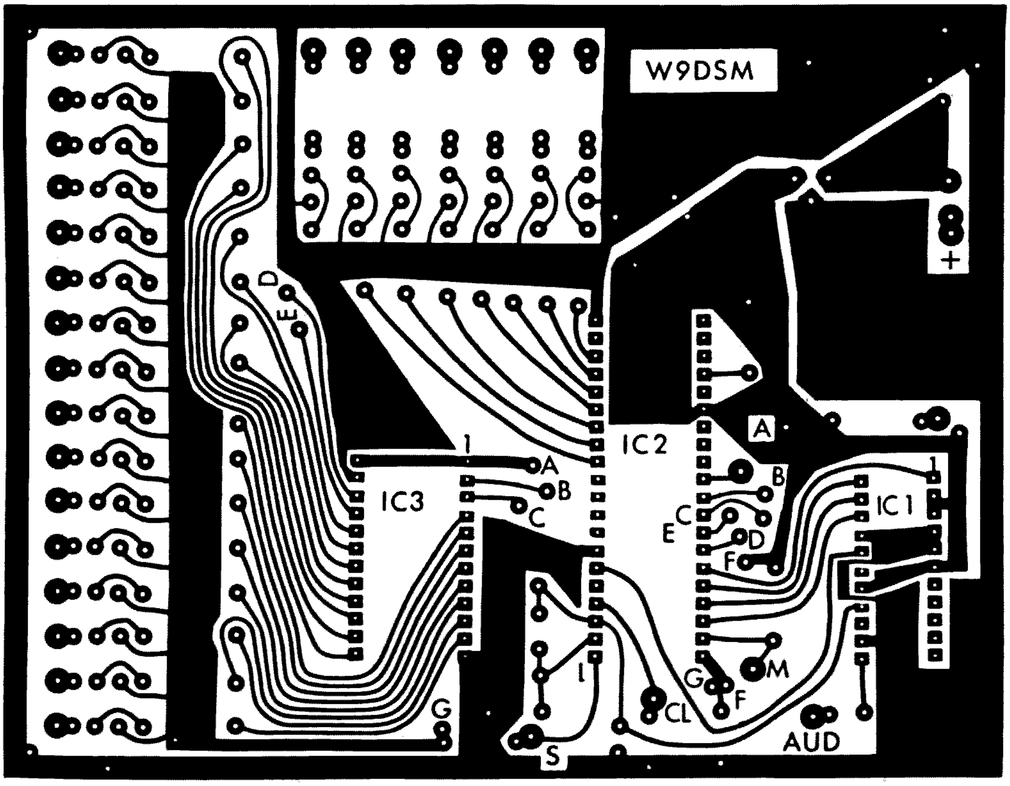


Fig. 4. PC board.

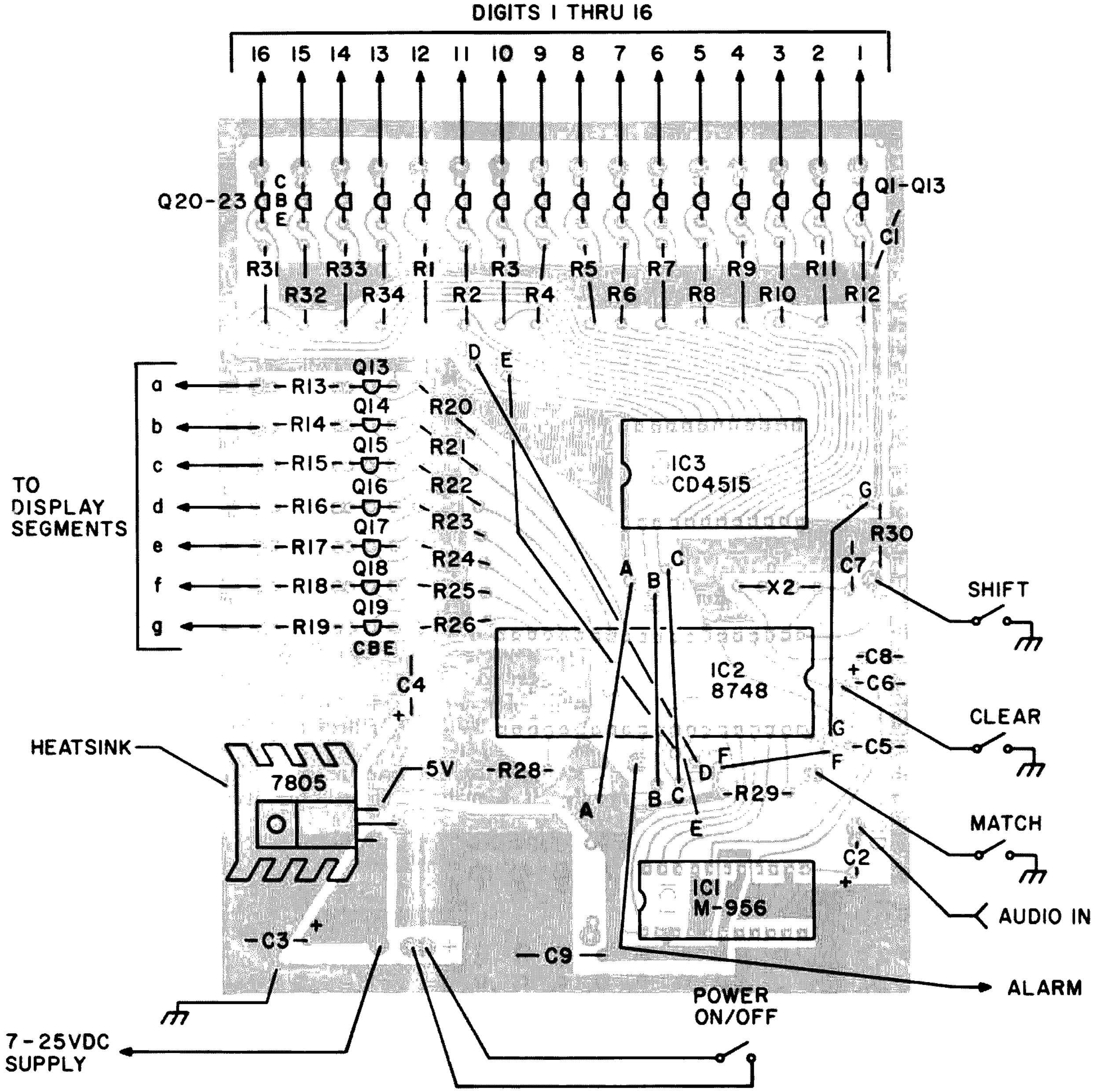


Fig. 5. Parts placement.

of LED displays that may be used in this circuit, I decided not to design a PC board for them. Any common-anode LED display may be used. If you decide to use the popular multi-digit stick-type displays, make sure that they are the multiplex type and not the direct-drive type. Whatever display you choose, wire all segment lines in parallel and bring out all anode lines separately. Your display may be any length you choose up to 16 digits. I limited my first prototype to only 12 digits. Simply leave out any digit drivers at the left side of the display that are unused.

The 5-volt regulator chip, IC4, can get quite warm during operation since the circuit draws about 250 mA. Because of this, a heat sink should be included. The PC board layout includes space for a TO-220-style heat sink.

There are seven jumpers, labeled A–G, which should be installed on the board *after* all other components are in place.

Initial power-up should be preceded by a voltage check with IC4 in place and IC1, IC2, and IC3 removed from their sockets. Check the power pins for proper voltages. These ICs are getting less expensive but still are not cheap enough to blow because of a wiring error or solder bridge!

Once the voltage check has been successfully completed, disconnect power and install all ICs in their sockets. Note that IC2 points the opposite direction of IC1 and IC3. Apply power. If all is well, the display should come up blank. Feed a source of touchtone audio to the decoder. The decoder requires an audio voltage in the range of about 150 mV to 2 V p-p. As each digit is received, it should be displayed at the right end of the display. Successive digits will cause previously received digits to be shifted one place to the left.

Pressing the SHIFT button also will cause digits to shift

Parts List

Quantity	Designation	Description	Cost
16	R1-R12, R31-R34	Resistor, 1k Ohm, ¼ W, 5%	$ .96
7	R13-R19	Resistor, 27 Ohms, ¼ W, 5%	.42
10	R20-R26, R28-R30	Resistor, 3.9k Ohms, ¼ W, 5%	.60
2	C7, C8	Capacitor, 22 pF, 50 V disc ceramic	.16
3	C1, C5, C9	Capacitor, .01 μF, 50 V disc ceramic	.24
2	C2, C6	Capacitor, 1 μF, 16 V electrolytic	.34
2	C3, C4	Capacitor 10 μF, 25 V electrolytic	.36
16	Q1-Q12, Q20-Q23	Transistor, PNP 2N3906 or equivalent	4.00
7	Q14-Q19	Transistor, NPN 2N3904 or equivalent	1.75
1	IC1	TRK-956 DTMF decoder kit	22.75
1	IC2	8748 microprocessor (see text)	50.00
1	IC3	CD4515 CMOS decoder	2.49
1	IC4	LM7805 5-volt regulator	1.59
16	DIG1-DIG16	LED, 7-segment common anode display	16.00
1	—	40-pin IC socket	.49
1	—	24-pin IC socket	.33
1	—	PC board	10.00
1	—	Heat sink, T-220 style	.25

NOTE: The crystal, X1, and 22-pin socket are included in the TRK-956 kit available from Teltone Corp., PO Box 657, 10801 120th Ave. NE, Kirkland WA 98033-0657; (206)-827-9626.

left, but instead of a new digit appearing, a blank will be inserted at the right end. This SHIFT button is very handy to insert blanks between incoming digits. It may also be used, when held down, to temporarily freeze what is on the display.

To program the unit to recognize a specific code, first press the CLEAR button to clear the display and memory. Then enter in the code that you want recognized. Do not enter any additional digits or blanks that you do not wish included in the sequence. Then press the MATCH button. From now on, any time that that exact code is received, the alarm line will be activated. Each time the code is recognized, the alarm line will stay activated only for as long as no additional digits are received. The matching process will be deactivated and memory purged when the CLEAR button is pressed.

Conclusion

I wish to thank Paul Hamilton WD4MQQ for his excellent photographic assistance and his PC board expertise. I also wish to thank Bill Kaylor W9DSM for developing the PC board layout and also for his nagging, which made me finally build this thing.

As I mentioned previously, I will make available preprogrammed and tested 8748 microprocessors for $50.00. Printed circuit boards are $10.00 each. ■

Color Computer SSTV: Part II

Complete the picture by adding weather-satellite facsimile to your new color SSTV system.

Editor's note: Part I of this article, detailing a complete color SSTV interface, appeared in the November, 1984, issue of *73*.

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San Jose CA 95124

Dr. Ralph Taggart WB8DQT
602 Jefferson
Mason MI 48854

With the initial success of the K6AEP interface, SSTV software, and high-resolution display board, the next "new" application considered was facsimile. HF FAX operation has never had much of a following among amateurs but there is one area where amateur FAX techniques are booming—weather satellites.

Photo A. An infrared (IR) view of the NW quadrant of the earth as transmitted by the GOES E spacecraft using the WEFAX imaging format. A major frontal system can be seen wrapping around from the Gulf Coast up into New England. Broken frontal activity can also be seen in the Rockies and Plains states. Although some of the gridding of state borders and other features can be resolved, one of the higher-resolution formats (see photos) would be required to capture all the details in a picture of this type.

Thousands of amateurs and non-amateurs alike track the many different kinds of weather satellites now in orbit, and what has been needed for years is a nice, simple, and versatile display system that would

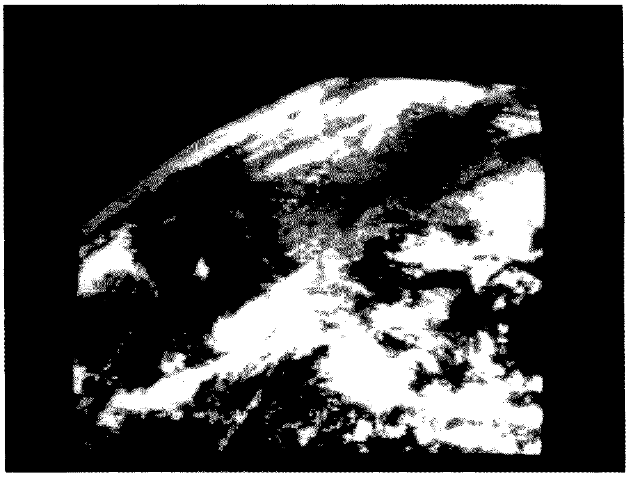

Photo B. Full-frame display of the NW quadrant of the earth as seen by GOES E in visible light. This image covers the same area as Photo A but visible-light imagery is rarely gridded. Even with the full-frame display the resolution achieved exceeds that of some small CRT display systems and is entirely adequate for most uses.

handle pictures from all of them! K6AEP was certain that the SSTV software could be modified for FAX display, and WB8DQT was equally certain that a multimode satellite interface could be designed to take advantage of the CoCo® as an image processor and display system.

With the two of us madly experimenting in our areas of expertise, we soon had a workable system up and running, and the results exceeded all of our expectations! With the satellite interface to be described this month (and with the high-resolution display board described in Part I) you can be scan-converting all types of US and Soviet weather-satellite pictures in no time at all! The mix of features available with the current software is mind-boggling compared to conventional techniques! Some of these features include:

- Full-frame display of imagery from all current operational satellites. These include both geostationary (US GOES, European METEOSAT, and Japanese GMS) and polar-orbiting spacecraft (US TIROS/NOAA and Soviet METEOR).

- The ability to capture extremely-high-resolution subsets of any images that exceed the theoretical resolving power of the image format.

- Computerized "zooms" on any portion of the image in memory.

- The ability to rotate images by 180 degrees, thus eliminating the upside-down pictures characteristic of south-to-north polar-orbiting passes.

- The capacity to enhance the contrast of the satellite picture—a real boon in the case of infrared polar-orbit imagery.

- Two different kinds of false-color display.

- The ability to generate hard copy using a graphics printer.

This is a mix of features you cannot find in any available display system, but there is even more! If you combine the SSTV interface (Part I) with the satellite interface to be described here, you obtain the following additional features:

- Complete HF FAX display capability for wirephotos and weather charts.

- The ability to record or transmit weather-satellite pictures in standard SSTV formats.

All of this may seem like quite a tall order but we can deliver—as we hope to demonstrate here. Let's get fired up and see how it's done!

Photo C. A NOAA 7 visible-light APT pass showing the east coast. Delaware, New Jersey, and Long Island show quite clearly in this full-frame display but much of New England is buried under a major cyclonic storm system in the process of moving out to sea. Lake Erie and Lake Ontario are visible at the top center of the display.

The Satellites

The one thing we do not have the space for is a description of the various satellite systems and image products. Your best source of information in that area is the *New Weather Satellite Handbook*, available at your local library (out of print). This publication provides all of the information on the satellites, their video formats, tracking and antenna alignment, construction of receivers, antennas, test equipment, and a full range of construction projects for FAX and CRT image display. If you are into satellites, you probably have the book already and can move directly to the CoCo scan-converter project. If you are new to the game, you had better find a copy so that you are ready to go when your hardware is on-line.

The Weather-Satellite Interface

At this point we will deal with how to condition and process the satellite signal for proper input to the CoCo. Satellite mode is relatively unimportant in the discussion which follows. Simply keep in mind that we are dealing with an amplitude-modulated 2400-Hz tone (black = minimum and white = maximum) with line rates of either 120 or 240 lpm (equivalent to either 2 or 4 Hz).

Each of the circuit descriptions to follow has several sections. The *Function* description tells what the circuit does; the *Operation* section describes how it works; the *Construction* section will describe any specifics that need be observed in laying out or wiring the circuit; the *Adjustment* section tells how to set up that part of the system. Actual operation of the complete interface will be described under "System Operation."

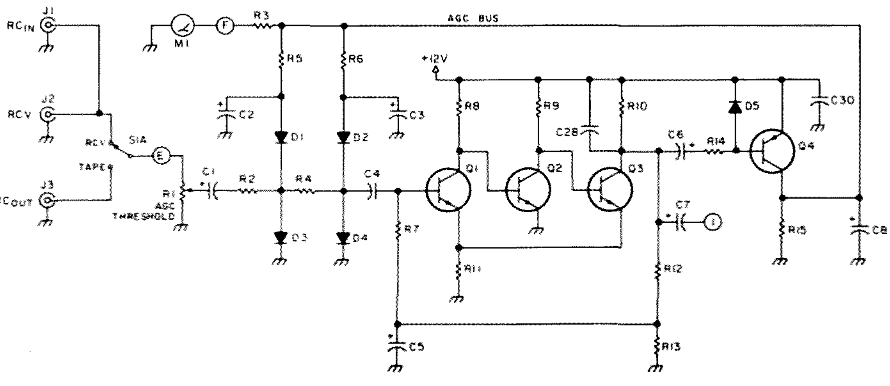

Fig. 1. Automatic gain control.

Main-Board Pinouts

Schematic Designation	I/O Function
A	Ground
B	+5 V (If regulator off board)
C	+12 V
D	−12 V
E	Video in from S1A
F	Agc meter
G	Contrast control
H	Contrast control
I	Video out to J7
J	Clock out to J4
K	Clock out to S1B
L	To Phase switch
M	To 120/240 lpm switch
N	Sync out to J6
O	To Reset switch

Front-Panel Controls and Indicators

- Power switch (If supply internal)
- Power lamp
- 120/240 lpm switch
- Phase switch
- Reset switch
- Agc meter
- Contrast control
- RCV/Tape switch

Rear-Apron Connections

Power	Ac or dc
RCV	From station receiver
RC Out	Right-channel tape output
RC In	Right-channel tape input
LC Out	Left-channel tape output
LC In	Left-channel tape input
Sync	To CoCo serial port
Video	CoCo right joystick port

Main-Board Controls and Indicators

Agc threshold	R1
Black level	R31
Clock freq.	C17
Vco lock	R42
Sync lock	D9 Indicator

Table 1. Packaging data.

One final note. It is assumed that the interface will be wired on a plug-in prototype card or on a PC board available from one of several vendors. The pinout designations in the following descriptions are arbitrary and the actual pinouts on your board will have to be related to these designations. Table 1 is provided to summarize the pinout designations used in the descriptions to follow. This information can be related to your board documentation or consulted as you work up your own layout. A list of vendors known to be supplying boards, kits, and wired-and-tested units is included in Part I of this article.

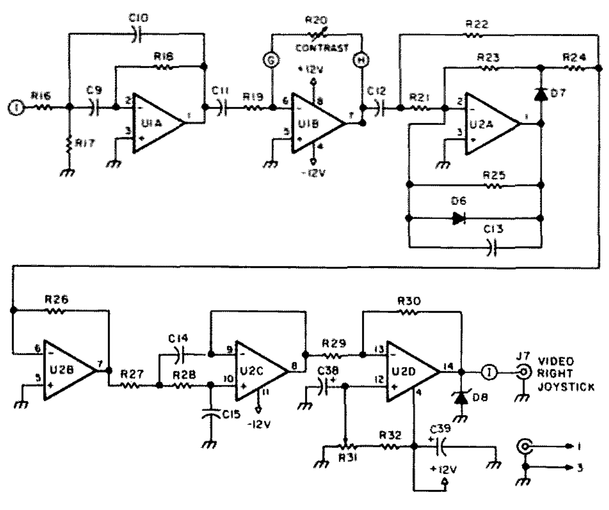

Fig. 2. Video circuits.

Automatic Gain Control (See Fig. 1)

Function. Since weather-satellite video involves amplitude modulation of an audio tone, the various video circuits are sensitive to peak subcarrier levels. With multiple satellite video sources, different receivers, tape systems, etc., constant readjustment of video-input levels would be required to maintain an acceptable gray-scale range. The automatic-gain-control (agc) circuits process signals of varying levels, delivering a signal of constant peak amplitude to the rest of the video processing circuits. Thus the video system functions with minimal adjustment over a wide range of input levels.

Operation. Video from the receiver is routed to J2 (Receiver) with J1 (RC In) in parallel to provide the capability to simultaneously display and record receiver signals. Video from the tape recorder is connected to J3 (RC Out). Selection of either receiver or recorder video is by means of the RCV/Tape switch (S1A). The video line from the switch enters the interface board at pin E with the Agc-Threshold control (R1) functioning as a load.

From R1, the signal is routed through a two-stage diode network (D1–D4) which provides attenuation as a linear function of the control voltage on the agc bus. From the attenuator, the signal is routed through a three-stage agc amplifier (Q1–Q3) with a fixed voltage gain of 100. Normally the output of this amplifier is about 2 V p-p. The amplifier drives the agc detector (Q4) which develops the agc control voltage on its collector. The attack time constant of the detector is a function of C6 and R14 while the decay time constant is determined by C8, R15, and the series resistance of R3 and the 50-microamp agc meter (M1).

If the peak input signal should increase, the agc bus voltage will rise, increasing the attenuation in the diode network and lowering the output of the agc amplifier to its previous value. Similarly, should input peak level decrease, the agc bus voltage will drop, decreasing input attenuation and raising the output of the agc amplifier. The output of the agc amplifier chain, maintained at a relatively constant peak level, drives the remaining video circuits at point (1). The agc meter serves to indicate the agc control voltage and is used to ensure that input signals produce control voltages in the most linear portion of the agc response curve (1–2 V).

Construction. Note that Q4 is a PNP transistor and must be installed with its emitter on the 12-V bus. Also note the polarity of C6 which is oriented differently from all of the other tantalum coupling capacitors.

Adjustment. For best results, the output from the receiver should be tapped at the top of the volume control through a .1-µF coupling capacitor to provide a constant output level that is independent of the receiver volume-con-

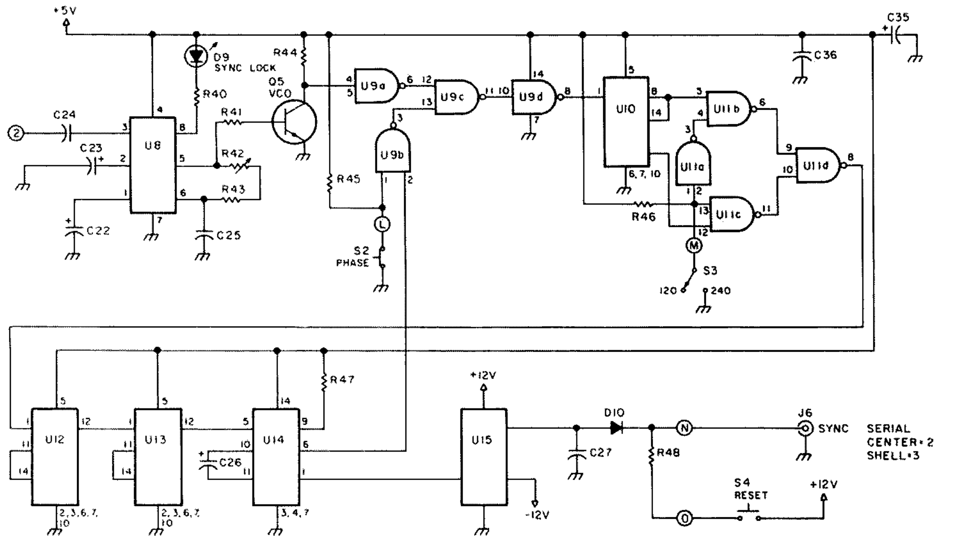

Fig. 3. Line synchronization.

trol setting. With noise output from a vacant satellite channel, adjust the Agc-Threshold control (R1) for an agc-meter (M1) reading of 15. The output of the tape recorder should be adjusted to produce an agc-meter reading between 10 and 20.

Video Circuits (See Fig. 2)

Function. The video circuits provide subcarrier filtering, detection, post-detection filtering, and gain adjustments to properly drive the joystick (A/D) input.

Operation. Video from the agc amplifier (point 1) is routed through an active bandpass filter (U1A) with a center frequency of 2400 Hz, a bandwidth of 1600 Hz, and unity gain. The filtered output drives a variable gain stage (U1B) with gain set by the front-panel Contrast control (R20).

U2A and U2B comprise a precision full-wave detector that generates a negative-going signal containing the modulation envelope superimposed on the post-detection 4800-Hz subcarrier component. U2C is an active low-pass filter with a nominal cutoff frequency slightly above 500 Hz. The roll-off characteristics of this filter ensure optimum resolution in the highest-resolution sampling modes.

U2D is an inverting amplifier that adjusts the video signal to the 0–5-V range required for the joystick A/D input. The offset is adjustable (R31) to set the desired black level while the Contrast control provides the drive adjustment that determines the maximum white level. D8 provides white-level clipping at 5.1 V. The detected waveform is routed off the main board at pin I and on to J7 (Video) on the rear apron. The center conductor of the mating jack for J7 is connected to pin 1 of the joystick plug while the shell (ground) is connected to pin 3 of the joystick plug.

Construction. The front-panel Contrast control should be wired so that minimum resistance corresponds to maximum CCW rotation of the control shaft. The joystick plug can be a hard item to obtain. The easiest approach is to disassemble a standard CoCo game joystick, since you get the plug with cable attached. The phono plug to J7 should be wired with the yellow lead to the center pin and the black wire to the shell.

Adjustment. Proper video adjustment requires the agc circuits to have been set up previously. Preset the Contrast control (R20) to the maximum CCW position and preset R31 so that the wiper arm is at ground potential. With the program running and video at the input, adjust R31 to just before the point where the black background starts to gray out. Then adjust the Contrast control for the most pleasing gray-scale response.

Line Synchronization (See Fig. 3)

Function. The business of transferring incoming video into memory must be very closely related to the satellite line rate. The actual loading operation is initiated by line-sync pulses which must occur at the same rate at which the satellite video is being transmitted and at the same time a line of satellite video begins. The line-synchronization circuits provide an accurate 2-Hz (120-lpm) or 4-Hz (240-lpm) trigger pulse to control the loading operation and also provide for proper phasing—the ability to shift the position of the line-loading pulse to ensure that it coincides with the beginning of satellite video lines. In addition, provisions are included to ensure the required timing accuracy for both live and tape-recorded imagery.

Operation. The heart of the sync circuit is a phase-locked-loop (PLL) tone-decoder chip (UB) which is designed to lock to a 2400-Hz reference signal at point (2). Sources for this reference tone are discussed under the heading of "Clock Circuits," below. With 2400 Hz applied at point (2), the internal voltage-controlled oscillator (vco) of UB will lock to this signal since the vco adjustment control (R42) of U8 has been set to free-run near 2400 Hz. When U8 has locked to the tone at point (2), an internal-control transistor pulls low and lights an indicator LED (D9—Sync Lock) to show that lock has occurred. The 2400-Hz vco signal is buffered to TTL levels by Q5 and applied to a set of gates in U9. U9 controls the phasing function which will be discussed below.

For the moment, let us assume that the 2400-Hz vco-derived signal is gated through U9 and on to U10—a divide-by-12 counter. Two outputs are available from U10—a divide-by-6 output (400 Hz) at pin 8 and a divide-by-12 output (200 Hz) at pin 12. U11 is wired as an SPDT digital switch which selects the 400-Hz output in the 240 position of the lpm switch (S3) or 200 Hz in the 120 position. The output of U11 is routed through two decade counters (U12 and U13), providing a total frequency division of 100. With the lpm switch in the 240 position, the output of U13 is a 4-Hz square wave, while in the 120 position it is a 2-Hz square wave. The output of U13 triggers a single-shot

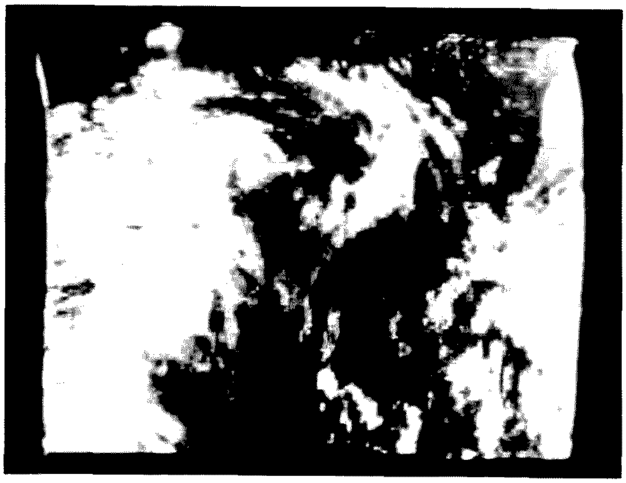

Photo D. A full-frame display of a "standard" 120-lpm Soviet METEOR display. The 120-lpm METEOR imagery does a great job on clouds but land/water features are difficult to discern unless lighting angles are almost perfect. 240-lpm "advanced" METEOR transmissions do a superb job on land/water features but these spacecraft are apparently still experimental and hence their service life seems short; they are on only intermittently.

(U14) which provides a 5-ms line-trigger pulse at either a 4-Hz or a 2-Hz repetition rate. This pulse is buffered by U15 to RS-232 levels to drive the CoCo serial port via the Sync connector (J6) on the rear apron. The Reset switch—a normally-open push-button—is wired to provide +12 V to the RS-232 line for manual reset.

Although the PLL and digital dividers provide the proper line-trigger rate, they are not sufficient to ensure that triggering is in phase—a condition where the line-trigger pulse corresponds to the start of a line of satellite video. Since it is desirable that the interface be usable in a wide variety of FAX formats, a simple manual-phasing circuit is provided. U9A buffers the vco-derived 2400-Hz tone, which then is applied to one input (pin 12) of U9C. The other input (pin 13) is derived from the output of U9B. This input is normally high since one input of U9B (pin 1) is normally held low by the normally-closed Phase push-button switch (S2).

Thus the 2400-Hz reference signal is typically gated through U9C, through U9D (a simple buffer), and on to the divider chain. When the Phase switch is pressed, however, it will open, causing the pin-1 input of U9B to go high. The output of U9B is then controlled by the status of the other input—pin 2. This pin is connected to the Q output of the 5-ms single-shot. Normally this pin is low, but for 5 ms of each line, the SS-trigger interval, pin 2 of U9B is pushed high, causing the output of U9B to go low for the 5-ms trigger interval.

This prohibits the 2400-Hz reference signal from going through U9C for the 5-ms interval, causing a 5-ms counting error once each line pulse for as long as the Phase switch is depressed. This causes the trigger repetition rate to be slowed (by about 2%), and since the trigger rate and the satellite line rate are no longer in step, the edge of the satellite image will migrate toward the left edge of the TV screen when the Phase switch is held open. When the left picture edge is aligned with the left edge of the TV screen, indicating a properly phased display, the Phase switch is released, the output of U9B goes high, and the 2400-Hz signal is gated through U9 without interruption, thus restoring the proper trigger rate.

Construction. The only note here is not to confuse the Reset and Phase push-button switches. The Reset switch is a normally-open type while the Phase switch is normally closed.

Adjustment. With 2400 Hz applied at point (2), adjust the vco adjustment control on the board (R42) until the Sync-Lock indicator on the board (D9) comes on. R42 should be set to the midpoint of the range where D9 provides a solid lock indication. A logic probe on pin 6 of U14 will show a series of short, high pulses indicating the proper operation of the divider chain. The pulses should be noticeably faster in the 240 position of the lpm switch than they are in the 120 position.

Clock Circuits (See Fig. 4)

Function. The clock circuits are designed to provide a 2400-Hz reference signal for both real-time and recorded-image display. The subcarrier signals of the US GOES and TIROS/NOAA spacecraft are phase-locked to the video line rate and could be used as a frequency reference. Unfortunately, this is impractical for several reasons. In the case of the GOES spacecraft, occasional modulation anomalies will drop the subcarrier black level to 0%, causing the line-sync circuits to lose lock and hence synchronization.

In the case of the TIROS/NOAA spacecraft, signal fades resulting in high noise levels also can cause sync lock to be lost. In addition, the standard Soviet METEOR spacecraft have subcarriers that are not locked to the video line rate and hence cannot serve as a suitable frequency reference. HF FAX signals have a variable subcarrier frequency (subcarrier FM modulation identical to the video swing for SSTV) so that sync lock is not possible with these services.

In order to make the interface compatible with the greatest range of FAX services, a crystal-controlled 2400-Hz signal source is employed. The crystal sync source is used directly during live image

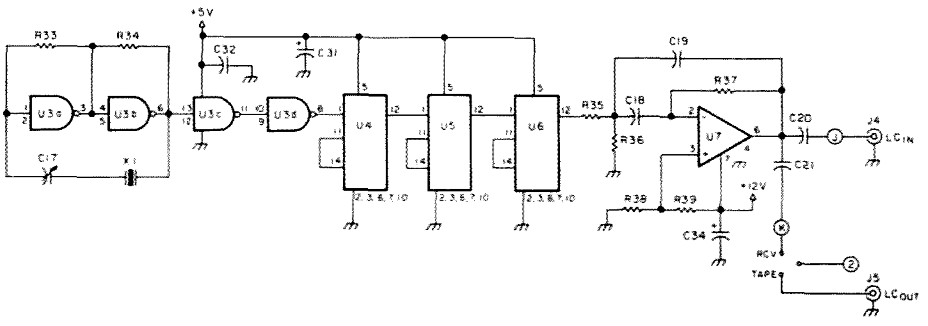

Fig. 4. Clock circuits.

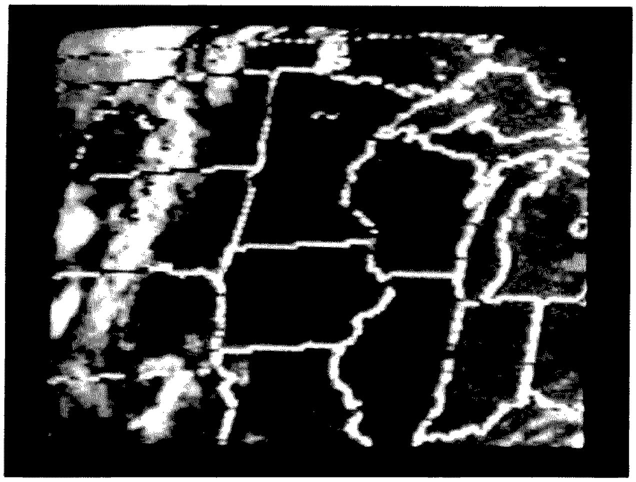

Photo E. Example of High Resolution 1 sampling of an IR WEFAX frame such as in Photo A. It shows a frontal system extending down the central Dakotas into Nebraska.

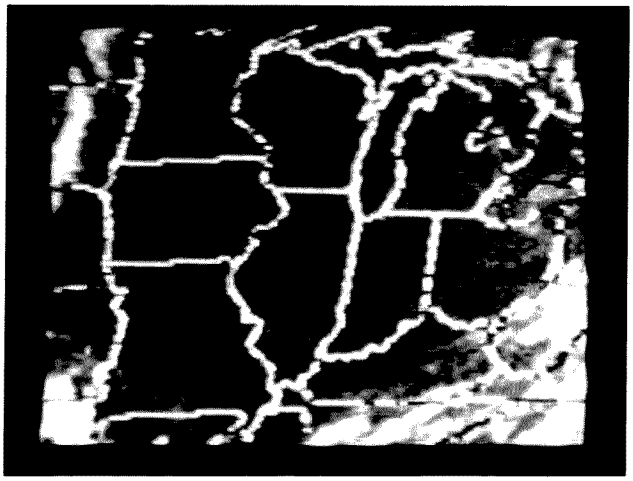

Photo F. The area in Photo E six hours later. In the upper-left corner of the image you can see that the front has intensified and that the system has moved into eastern South Dakota with some low-altitude clouds (indicated by their darker-gray color) moving into western Iowa.

display and is also recorded on the left channel of a stereo tape system while the video subcarrier signal is simultaneously recorded on the right channel. During playback, the line-sync PLL is locked to the recorded tone on the left channel and will effectively track frequency variations caused by tape speed changes during recording and playback, thus maintaining line synchronization.

Operation. U3 functions as a crystal-controlled oscillator/buffer operating at 2.4 MHz with fine frequency adjustment provided by C17. The 2.4-MHz signal is divided by 1000 using three decade counters (U4, U5, and U6). The 2400-Hz square-wave output from U6 is passed through a 2400-Hz active filter stage (U7) to convert the square wave to a sine wave. When the RCV/Tape switch (S1B) is in the RCV position, the PLL tone detector in the line-sync circuit is driven directly by the 2400-Hz crystal reference. A sample of the 2400-Hz signal also is routed to the left channel input of the recorder (LC In) at J4. With the switch in the Tape position, the PLL is driven by the signal recorded on the left channel (LC Out) via J5.

Adjustment. The only operational adjustment is to set the oscillator output accurately to 2.4 MHz by adjusting C17. This can be accomplished in one of three ways:

(1) Connect a frequency counter to pin 8 of U3 and adjust C17 for a frequency of 2.4 MHz to the resolution limits of the counter.

(2) Calibrate a receiver using WWV and a crystal calibrator. Connect a short test lead to pin 8 of U3, loosely coupling the lead to the receiver input. Adjust C17 to obtain precise zero beat at 2.4, 4.8, or 7.2 MHz. The latter frequency is useful for ham-bands-only transceivers.

(3) Display live images using the interface and WEFAX software. If the picture margin drifts to the right as the image reads out, the oscillator frequency is high. If it drifts to the left, the frequency is low. Adjust C17 until the margins are precisely vertical.

Packaging and Power Supplies

There is an old saying in the home construction game that once you have the boards wired you may be almost half done! What kind of packaging you use is pretty much up to you. In the case of the WB8DQT prototype, the display board was placed in its own metal enclosure with a 5-V regulator chip to run the board off the station's +12-V bus. Display-board power drain was measured at 600 mA.

The interface board was dropped into its own cabinet along with a small receiver. The +5-V interface requirements were taken care of with a 5-V regulator chip on-card and the current drain on the +12-V bus was 280 mA. The −12-V drain was minimal—slightly less than 20 mA. Required front-panel controls and indicators include the 120/240 lpm switch, the RCV/Tape switch, the Phase and Reset push-button switches, the Contrast control, and the agc meter. If the power supply is internal, you will also need a power switch and a power-indicator lamp.

The rear apron tends to be a busy-looking place with lots of cables heading off to other gear. There are a total of five audio leads —RCV (receiver output), RC In and LC In (right- and left-channel tape-deck inputs), and the RC and LC Out jacks (tape-deck right- and left-channel outputs) —where you should use standard shielded audio cables (phono-plug terminations) for the interconnections. The Video cable runs from the rear apron to the right joystick port of the CoCo while the Sync cable runs from the interface rear apron to the CoCo serial port. Although not absolutely necessary, it is helpful if the output from the receiver has a constant level—if only to simplify maintaining constant recording levels. A shielded audio lead coupled to the top of the receiver volume control through a .1-uF capacitor should do the job nicely with most receivers.

Tape Equipment

Obviously, the minimal satellite installation consists of the interface, display board, 64K CoCo, and your satellite-receiving gear. In order to make the most of the program features, however, you really should include a good (by music standards) cassette or reel-to-reel stereo tape deck. Regular cleaning and pressure-pad maintenance will keep almost any recorder up to par if you use high-quality tape. Taped transmissions never have

Photo G. A High Resolution 1 image obtained from a NOAA 7 visible-light APT pass showing the Great Lakes in considerable detail. A multitude of small lakes are clearly visible in southern Canada. For the ultimate in high resolution you can use the HR-2 format as shown in Photo H.

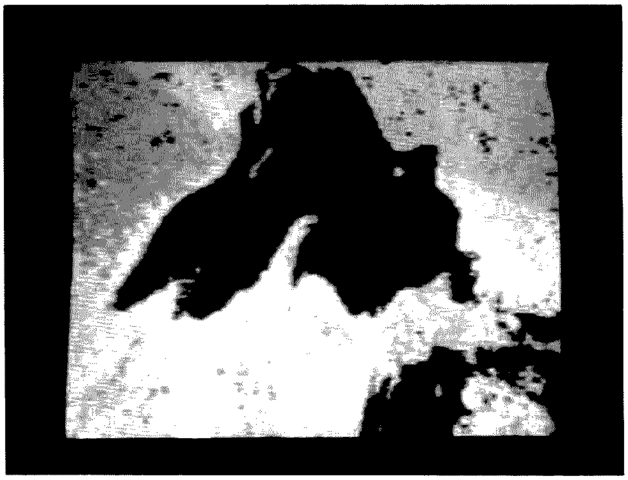

Photo H. The HR-2 format for Photo G. Lake Superior takes up much of the image area. The resolution of the HR-2 format equals the theoretical resolution limit for APT and WEFAX imagery and reveals details that are beyond the capacity of most systems.

quite the quality of "live" displays, but you will rarely notice the difference in practice. All of the photos used to illustrate this article are taken from tape, and the versatility of the program routines possible with tape makes it well worth the marginal loss in image quality.

In order to keep things simple, recordings should be made at constant input and output levels. The output level is easy—simply set it for maximum on both the left and right channels for most decks. Assuming the system has been set up as specified (video into the right channel, sync into the left), you should set the left-channel recording level for 0 VU with the interface running. With the receiver set to an empty channel (no satellite signal), set the right-channel recording level for a mid-range reading (−10 to −7 VU on most decks) using the noise output of the receiver as the signal source.

System Operation

What follows will be a very brief outline of the operation of the major routines in the present WEFAX Rev.3 program available from K6AEP. The software will certainly evolve with time, but most of the evolution will be "bells and whistles" in the sense of new routines. The basic image-display routines should remain fairly stable and you should have little trouble relating the instructions which follow to the extensive program documentation you will receive with your software.

As we discuss program features, we will have occasion to talk about two different displays—what we will call the "CoCo display" and the "image display." The CoCo display is simply the normal computer monitor where prompts, menus, and inputs are displayed. The image display is the monitor where the output of the display board is viewed.

Loading the Program. Insert the cassette and rewind if required. Preset the cassette volume level to about 5, set the cassette recorder to play, type CLOADM, and hit the <ENTER> key. The cassette machine will start to run and an S will flash in the upper-left corner of the CoCo display. The display board and interface should be powered up at this time, but pay no attention to the image display—expect garbage! When the WEFAX program is found, the flashing S will change to a flashing F and a short notice will print out to the effect that the WEFAX program is loading and will execute automatically when loaded. This magic event is easy to spot—you will suddenly get the main menu display (shown in Fig. 6) and the image display will show a random but static pattern based on the contents of the display RAM at power-up.

Virtually everything in the program starts with the main menu, and no matter where you are in the program you almost always can get back to this menu by hitting the <CLEAR> key on the CoCo keyboard. If you find the random-image display a bit disconcerting, you can get a grayscale display (actually color bars) by typing I followed by G followed by <CLEAR>. If your monitor is like most, you will have considerable vertical overscan on the image display. We would suggest adjusting the monitor height control to compress the display slightly to minimize the loss of picture information at the top and bottom of the screen.

Notes on Contrast Settings. At this point we will assume that the interface has been checked out as noted in the *Adjustment* section of each circuit description. If not, this is the point at which to complete checkout. The only variable that remains to be considered is the proper Contrast setting for each class of satellite. The first time or two you display a given type of picture you can expect to jiggle the Contrast setting until you get the best image display for that mode. Once you have determined the optimum setting for each mode, you should mark it on the front panel. You probably will end up with distinctly different settings for WEFAX, APT Visible, APT IR, 120-lpm METEOR, and 240-lpm METEOR. Alternatively, you may wish to install a small rotary switch on the front panel to switch in a small PC pot for each mode. With the switch positions properly labeled, you need only optimize each pot in turn, after which you can use a switch setting appropriate to the mode you wish to display.

Primary Image Display

General Notes. The Interface RCV/Tape switch should be set to RCV for "live" display directly from the receiver or to Tape for recorded display. Early experiments are best done with tape as you can always rewind the tape if you make a mistake, or you can display a full frame followed by one of the high-resolution formats, etc.

All image displays will begin with the R option from the main menu. This will reset the image display and the incoming picture will begin to read out. At the same time, a secondary menu (Fig. 7) will appear on the CoCo display and will provide you with your display options following phasing. The image display can be "frozen" at any time by hitting the <CLEAR> key, and the CoCo display will return to the main menu.

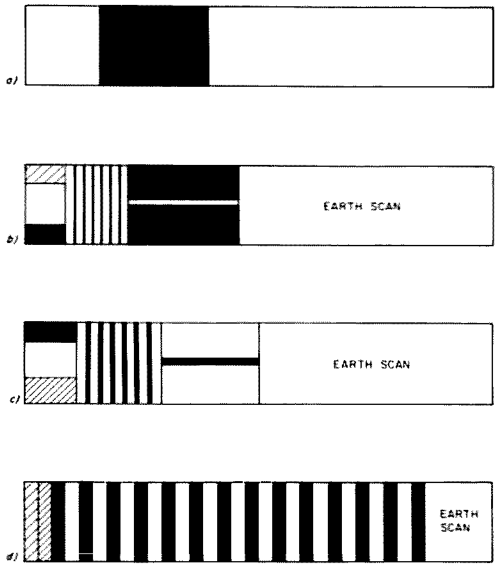

Fig. 5. Diagrams of line-sync pulses for the various satellite-video formats. Proper phasing of satellite pictures requires recognition of each kind of pulse. The Phase switch is pressed until the desired sync pulse moves across the screen and just off the left edge of the display. (a) shows the WEFAX line pulse—a simple black bar on a white background. It is transmitted during the phasing interval at the start of a GOES or METEOSAT frame transmission. (b) shows the sync pulse for NOAA visible-light APT imagery. It consists of seven cycles of 1040-Hz subcarrier modulation, followed by a black interval representing the scanner's view of space just prior to the start of the earth scan. Once each minute a white minute marker bar will interrupt the black space scan. The essential cues for the visible-light sync pulse are the black space scan and usually high-contrast video in the earth scan. Just to the left of the pulse train is a telemetry signal that is displayed as horizontal gray-scale data. (c) shows a typical infared (IR) line pulse in the NOAA APT format. This pulse is also seven cycles in length but it is seven cycles of 832-Hz modulation so it is somewhat wider than the visible-light pulse. The IR pulse is followed by a white interval (cold) representing the space scan. The earth scan is typically quite white and low in contrast. IR minute markers are black. To the left of the pulse is a telemetry gray-scale pattern similar to that of the visible-light pulse. (d) is the line-sync pulse for standard 120-lpm METEOR imagery—a long 13-cycle pulse that is very easy to recognize. The earth scan data is immediately to the right of the pulse while vertical gray-scale stripes are immediately to the left of the pulse. All of these pulses are enlarged illustrations—much as you might see with the HR-1 or HR-2 display formats. They are quite easy to recognize in full-frame display however, once you are familiar with their appearance.

WEFAX Display. Set the 120/240 lpm switch to 240. When you hear the characteristic 300-Hz "start" tone, simply hit R from the main menu and watch the display. You should see a white background with a vertical black bar somewhere in the image display area (shown in detail in Fig. 5(a). Press and hold the Phase switch and this bar should march step-wise toward the left edge of the image display area. Allow the bar to move off the display to the left and release the Phase switch. About 20 seconds after the end of the start tone you should hear some rough subcarrier modulation as the picture header begins to print out.

At this point, press key 1 and the WEFAX picture will begin to display from the top of the image display area. When the display reaches the bottom of the screen, press the <CLEAR> key to freeze the image and return you to the main memory. Note that with the US GOES spacecraft the picture starts about 20 seconds after the start tone. The European METEOSAT delays only five seconds, so you will have to hustle to complete the phasing operation.

Photo A shows a typical infrared (IR) WEFAX display, while Photo B is a visible-light example.

APT Display. Images from the TIROS/NOAA satellites are transmitted continuously in the APT format and display can begin whenever the signal rises out of the noise and can continue until the spacecraft begins to approach the opposite horizon. Preset the 120/240 lpm switch to 120 and hit R from the main menu to start display.

Phasing with APT is governed by which image, visible light or infrared, you wish to display. Daylight passes will have both formats available while night passes will have a black visible-light display and only IR data will be useful.

I — TEST INTERFACE
R — RECEIVE HIGH DENSITY FAX
L — RECEIVE LOW DENSITY FAX ON TRS80C
D — DISPLAY IMAGE IN MEMORY
Y — MEMORY CHANGE
C — DISPLAY COLOR IMAGE IN MEMORY
T — PRINT PICTURE ON SCREEN
S — SELECT PRINTER SPEED
E — CONTRAST ENHANCE PIX
UP DOWN ARROW PICT UP DOWN

Fig. 6. Main menu display, WEFAX program.

WHILE VIEWING A FAX PIX
KEY 1 = WEFAX, APT, ADV METEOR
KEY 2 = STND METEOR
KEY 3 = HIGH RES 1
KEY 4 = HIGH RES 2
KEY 5 = HF FAX FAST
KEY 6 = HF FAX SLOW
KEY R = ROTATE PICTURE
ANY OTHER KEY WILL END

Fig. 7. Secondary display menu, WEFAX program.

Photo I. Polar-orbit infrared (IR) imagery in low contrast.

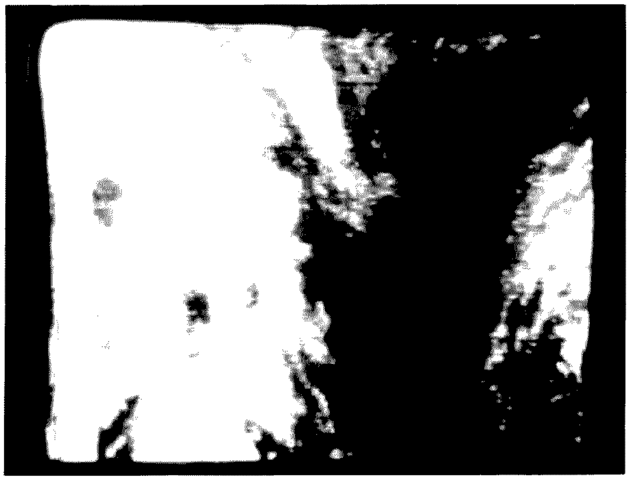

Photo J. Once the display has been optimized using the Contrast control, the image in memory can be enhanced using the contrast enhancement routine. Unlike other routines, enhancement alters the image in memory.

The visible-light sync-pulse train is shown in Fig. 5(b) while the IR-sync-pulse sequence is shown in Fig. 5(c). To display visible-light imagery, simply press and hold the Phase switch until the visible-light sync pulse passes off the left edge of the display. If you want IR display, simply hold the Phase switch until the IR pulse has moved off the left edge of the image display area. With either visible or IR phasing complete, hit key 1 to restart the display from the top of the image display area.

With a simple omnidirectional antenna you can expect to receive at least 10 to 12 minutes of imagery on a good pass. If you keep the display going unattended, the image will automatically reset as it reaches the bottom of the screen. For the first look at a pass, you may wish simply to let it scroll in this fashion. Once you have an idea of the features of interest, you can run the tape again and when you get to the point where you want to display the material, simply hit either the interface Reset switch or key 1 on the keyboard. Once the display fills up, simply hit <CLEAR> and the image display will be frozen while the CoCo display returns to the main menu. Photo C shows a sample of visible-light imagery from a daylight APT pass.

METEOR Display. Soviet polar-orbiting METEOR spacecraft come in two varieties—the standard 120-lpm spacecraft and the rarer 240-lpm birds which are apparently still experimental. Both types of METEOR imagery are restricted to visible-light data from daylight passes. For 120-lpm METEOR display you should preset the 120/240 lpm switch to 120 and hit R from the main menu to start display. The 120-lpm "standard" METEOR sync pulse is shown in detail in Fig. 5(d). As the image reads out, press and hold the Phase switch until the sync-pulse train marches out of view to the left of the image display. Release the Phase switch and hit key 2.

Like the APT format, METEOR pictures are continuous and you can scroll through an entire pass or hit the Reset switch to reset the display whenever desired and the <CLEAR> key to freeze the image display and return to the main menu. Photo D illustrates the results from a typical "standard" METEOR pass.

240-lpm "advanced" METEOR operation is similar except that the 120/240 lpm switch should be in the 240 position and you should hit key 1 following phasing.

High-Resolution Display

In order to provide for the display of extremely-high-resolution data, two high-resolution formats, High Resolution 1 and High Resolution 2, are supported by the WEFAX program. In each we sample a progressively smaller subset of the image with the capability of resolving finer detail. Prior to using one of these formats, you should display the entire image of interest to determine what features you wish to emphasize. Once this has been done, note some easily-recognized feature a short distance above the feature you are interested in. This feature will be the "recognition" feature and will tell you when you should shift to the high-resolution mode.

High Resolution 1. This is an intermediate format that will exceed the resolution limits of most CRT systems and many FAX displays. Assuming you have located the picture-area of interest to you and a suitable recognition feature, begin display with the main-menu R option and proceed to phase the image. In this case, however, you should phase the image so that the feature of interest will read out on the left half of the image display area. Key either 1 or 2 (depending upon mode) and watch for the recognition feature. As it begins to read out, simply hit key 3 and the High Resolution 1 sampling will begin. When display is complete, hit <CLEAR> to freeze the display and return to the main menu. Examples of HR-1 images are provided in Photos E and G.

High Resolution 2. The resolving power of this format exceeds that of any of the satellite formats and you can expect to see details that almost no one else can resolve. Start with R and phase the display so that the feature of interest will read out just to the right of the left image display margin. Key either 1 or 2 and watch for the recognition feature. As it starts to read out, hit key 4 and your HR-2 image will load quickly. Press <CLEAR> to freeze the display and return to the main menu.

An example of the HR-2 format is provided in Photo

Photo K. A full-frame display from a NOAA polar-orbit pass. The Great Lakes region is buried under a huge compound frontal system shaped like an upside-down V. Now see Photos L and M.

Photo L. An HR-1 display of the center of Photo K. The southern part of Lake Huron and all of Lake Erie can be seen between the open angle of the "V".

Photo M. An HR-2 view that reveals even greater detail, including a cloud "stringer" stretching across Lake Huron, a feature that is invisible in Photo K and barely resolvable in Photo L.

H. This is a demanding format due to the small area sampled but if you don't quite capture the area you want, simply run the tape back and try again. As you can see, the results are well worth the effort!

Display Options

Although most people would be quite happy just to be able to capture the full-frame or high-resolution formats, there is still quite a bit that can be done once the image is in memory! To access these functions, simply type D from the main memory and you will get a menu like that shown in Fig. 8(a). The functions you will use most often on this menu are summarized below. You can try these options in any order and as often as you like. Although the display will change with each option, the original picture will remain unaltered in the main memory.

(a)

DISPLAY PIX IN RAM
L = LOW DEN PIX
R = ROTATE PICTURE
T = TOP HALF
B = BOTTOM HALF
P = TOTAL PIX
1 TO 8 QTR FRAME

(b)

1	2
3	4
5	6
7	8

(c)

T
B

Fig. 8. (a) Display options menu. (b) and (c) Zoom formats.

Picture Rotation. South-to-north passes of polar orbiters will read out a picture in which south is at the top (start) and north at the bottom (finish); basically, the picture is upside down! If you type R from the display memory the image display will be rotated 180 degrees, and such inverted images will now be upright with north at the top. This neat software trick sure beats turning the monitor upside down or standing on your head to view the image!

Top and Bottom Image Subsets. Although the image in memory is stored in a 256 × 256 format, the standard display board format is 256 × 128, which means you lose some vertical resolution relative to the picture actually in memory. You can get all the resolution in memory by hitting either T or B, displaying the top or bottom half of the image in memory, using the entire image display area. Although this will distort the aspect ratio slightly—the pictures will appear "stretched" vertically—it is a quick way to look for fine detail that may be lacking in the full-frame format. The T and B formats are shown in Figs. 8(b) and 8(c).

Image Enhancement. IR imagery—particularly APT—can appear quite white and washed out, especially during the winter months, due to a lack of strong temperature differences between land and sea surface and overlying clouds. Careful adjustment of the Contrast control will help, but the pictures still will be pale compared to their visible-light counterparts. The E option from the main menu can help out in such cases. Once you have captured the picture you want, you can enhance contrast by a factor of 1.5 by typing E from the main menu.

When you do so, there will be a slight delay and then the E you have typed will disappear. If you type D followed by P, you can see your enhanced image. An example of a standard and an enhanced picture can be seen in Photos I and J. *Note that this routine should be used with care!* Unlike all the other routines discussed so far, it permanently changes the image in memory! If you don't like the results, you will have to reload the picture from tape to get the original version back on the screen. Also, although there is no limit to how many times you can run the E routine on a picture, the image will tend to degrade steadily after the first enhancement run. You can try additional passes through the routine if the first did not get you all that you expected, but don't say you weren't warned!

Hard Copy. One of the beauties of scan conversion is that you can view a large number of satellite pictures without piling up costs for photographic supplies or FAX paper. Obviously, however, there will be times where you would like to have a permanent copy of a particularly interesting picture. Photographing the TV display is one option, and you can use relatively economical roll film since you do not need the pictures immediately.

A second option is to use the T routine from the main menu. This will permit you to print the image being displayed using an Epson printer (MX-80 with the Graphtrax option, or the newer RX-80). An example of a full-frame printout is shown in Fig. 9. Full-frame printouts will have lower resolution than the image displayed but will be quite useful in most applications. The resolution of printouts from High Resolution 1 images is equal to that obtained with many CRT display systems. The advantage of the printer approach to hard copy is that the printer is useful in all other applications of your CoCo, so your hardware acquisition will have multiple uses.

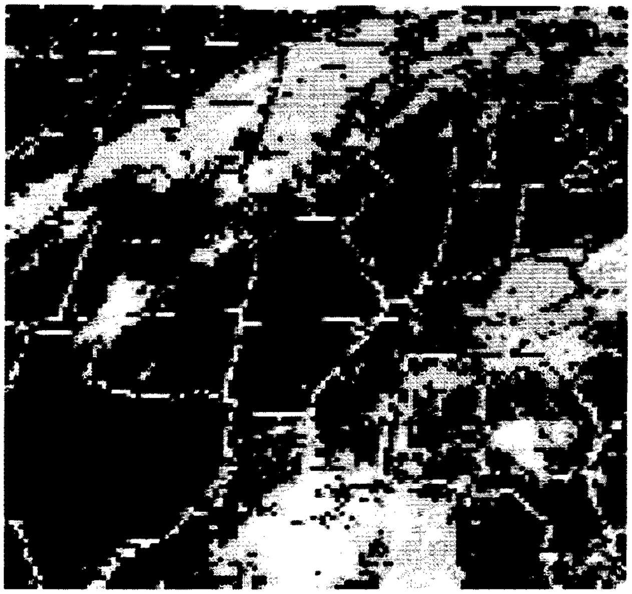

Fig. 9. An example of image printout using an Epson RX-80 printer. This is an HR-1 image from a GOES E infrared image of the United States (as in Photo A). This HR-1 view extends from Texas in the lower left to northern Florida in the lower right. Michigan is in the upper right and the US/Canadian border runs along the top. IR images display cold objects as white. The ground surface is warm and hence dark. Most of the cloud features in this view are mid-range gray, indicating relatively warm (and low) clouds. The white centers of the clouds in the Gulf of Mexico and southern Georgia indicate colder and higher cloud features.

Low-Density TRS-80C Display

Most of the remaining main menu functions that are available will not be discussed as they are more specialized and space is limited. The exception is the L routine which appears on the main menu and also on the display menu. This is a routine that will print a low-resolution, limited gray-scale version of a satellite picture directly on the TRS-80C display monitor without the use of the high-resolution display board. If you use a color monitor you should disable the color when using this option. The picture is quite crude and the routine is perhaps best used to check out the interface functions prior to getting the display board on line. This routine will not be supported with future program revisions and may eventually be dropped if other new routines have a higher priority.

High-Frequency FAX

Weather charts and almost any imaginable kind of picture material are transmitted regularly on HF (SSB) using various FAX formats. All of these have a video "swing" identical to that of SSTV—1500-Hz black to 2300-Hz white. Since HF video is identical to SSTV video, you can simply drive the CoCo joystick port with the output of the SSTV demodulator while driving the serial port with this month's interface to provide line sync. The only change in recording an HF FAX signal is to route the output of the HF receiver to the right-channel input with the right-channel output going to the input of the SSTV demodulator.

The single biggest problem with FAX is that the signal does not contain a 1200-Hz sync pulse, and since there are no intervening voice transmissions, the signal can be difficult to tune on SSB. One possibility is to wire up a pair of NE567 tone decoders with LED indicators, one tuned to 1500 Hz (black) and the other to 2300 Hz (white). The circuit values shown for U8 on the interface should do just fine for such decoders. Phasing on HF FAX usually uses one of two formats—white video with a black framing marker or black video with a white framing marker. In either case, if you tune so that both indicators flash during phasing, you will be right on frequency.

HF FAX uses several standard line rates—typically 120 but also 60 and 240 lpm. Begin by typing R from the main menu and phase the picture. You can then try keys 2, 1, 5, and 6 in sequence to see which gives the best display for the transmission in question. Once you have identified the proper key for a specific station, you should log the information for future use. Again, as in the case of satellite transmissions, recordings will let you experiment as long as desired to determine the optimum display format. Weather charts will tend to be disappointing due to the large amount of fine detail, but wirephoto transmissions yield excellent results. The press frequencies for this sort of thing are not widely publicized, but several books are available listing these and other "confidential" HF frequencies.

Parts List
(Weather-Satellite Interface)

Transistors

Q1-3, 5	2N4401 (General purpose audio NPN)
Q4	2N4403 (General purpose audio PNP)

Integrated Circuits

U1	LM1458 (Dual 741/Mini-DIP)
U2	LM324 (Quad op amp)
U3, 9, 11	SN7400N (Quad NAND gate)
U4-6, 12, 13	SN7490N (Decade counter)
U7	LM741CN (741 op amp/Mini-DIP)
U8	NE567 (PLL Tone decoder)
U10	SN7492N (Divide-by-12 counter)
U14	SN74121N (Single-shot)
U15	MC1488P (RS-232 Line driver)

Diodes

D1-7, 10	1N4001
D8	5.1-V, 1-W zener
D9	Radial mounting LED (sync lock)

Resistors

All values in Ohms. Unspecified units are 1/4 W, 5% composition or metal film. PC indicates A 1/4- to 1/2-W printed-circuit pot. Panel mounting indicates a standard panel-mounted pot.

R1	10k PC (agc threshold)
R2, 4, 32, 47	4700
R3	47k
R5, 6, 16, 21, 22, 24, 26, 29, 30, 35, 38, 39, 41, 48	10k
R7, 12, 15	56k
R8, 14	120k
R9	22k
R10, 19, 44, 45, 46	1000
R11	1
R13	6800
R17, 36	2700
R18, 23, 37	20k
R20	10k Panel mounting (contrast)
R25	1 megohm
R27, 28	2200
R31	1000 PC (black level)
R33, 34	470
R40	150
R42	5000 PC (vco adj)
R43	1500

Capacitors

Unless otherwise noted, capacitors should have a working voltage of at least 16 V. T indicates a dipped tantalum electrolytic, A an aluminum electrolytic (radial leads), M a dipped mylar™/paper capacitor, D a disc ceramic capacitor, SM a silver-mica capacitor, and MT a mica compression trimmer. All capacitance values in uF unless noted.

C1, 6, 7, 16, 26, 39	1 T
C2, 3	22 T
C4, 9, 10, 18, 19, 28	0.01 M
C5, 38	10 T
C8	100 A
C11, 12, 20, 21, 24, 25	0.1 M
C13	27-pF SM
C14	0.22 M
C15	0.047 M
C17	40- or 60-pF MT
C22	2.2 T
C23, 31, 35	4.7 T
C27	120-pF SM
C29, 30, 34	0.1 D
C32, 33, 36, 37	0.01 D

Misc.

X1	2.4 MHz at cut crystal/32-pF load/0.002%
M1	50-microamp panel meter (agc)
J1-7	Switchcraft 3501FR or other phono jack
S1	DPDT subminiature toggle (RCV/Tape)
S2	Normally-closed push-button (Phase)
S3	SPDT subminiature toggle (120/240 lpm)
S4	Normally-open push-button (Reset)
S5	SPST toggle (power if supply internal)
L1	12-14-V LED or other panel lamp (power)

The Future

The present CoCo FAX system offers extreme flexibility and excellent results. One of us (WB8DQT) has all kinds of CRT and FAX display systems but has used little but the CoCo since we got the system up and running. If new routines prove to be useful or if new FAX formats appear, they will be added to the software in an attempt to keep it as current and useful as possible. The guiding philosophy will be that inexpensive software upgrades are preferable to making extensive hardware modifications.

There is a hardware option, however, where you can expect to see developments—the display board. The basic high-resolution display board is limited to a 256 × 128 format since only 16K of static RAM is used. Despite this limitation, the FAX results are quite good as evidenced by the photos in this article—all of which were photographed from that standard display-board output. Some experimentation by K6AEP has shown that it is practical to load the display board with as much as 32K of static RAM—enough to provide a 256 × 256 display format!

By the time this article appears, Multimode and L. W. Interface will offer both versions. The 256 × 256 version is obviously a bit more expensive, but the display is capable of pushing the resolution limits of most monitors. The WEFAX Ver. 3 software has been modified (along with various SSTV options) to support either 256 × 128 or ×256 display. You can start with and stay with the first or later upgrade to the second and still use the same software.

Conclusion

Up to this point in time the differences in image formats and the equipment required for image processing have kept the various types of video experimenters separate and distinct. One of our goals has been to use the power of the 6809 microprocessor as a flexible image-processing system. With the power of a 64K CoCo, some hardware interfaces, and flexible software, the segregation of ATV, SSTV, FAX, and the weather-satellite crowd is a thing of the past—not to mention CW and RTTY! For about what you would pay for a dedicated system for any one of these modes, you can have it all!

If you stop to think that the same computer can calculate satellite orbits, keep your log, balance the checkbook, and teach the kids, we think you will agree that it will be a much easier job to sell the family on the "new" gear. Of course everything has its price. Once you are geared up you will have the terrible decision about which of all those modes you want to use when you fire up the rig! For that weighty question we can suggest only that you write a program to let the computer decide! ■

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Transistors: A Biased Approach

In Part I, KC0EW takes the mystery out of solid state with clear talk and practical examples.

Sometimes I think things were a lot simpler in the "good old days"—you know, vacuum tubes and all that. Then, you could visualize the electrons happily zipping from cathode to plate, with a varying charge on the grid adjusting the flow. You even had a nice orange glow from the filament when you turned the thing on, a reassuring visual indicator that something was happening. The transistor changed all of that—now all we have to look at are little metal cans that look just the same, on or off. And the way they operate! All this talk about "electron/hole pairs" and "minority carriers." It's a miracle anything ever gets designed with these things, they're so hard to understand.

Wrong. Transistors aren't much more complicated than any other electronic device (they can be a lot simpler than tubes in many cases), but they do have their own way of operating, and once you've learned a little about it and how to use them, everything's simple.

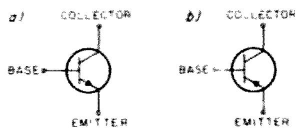


Fig. 1. NPN (a) and PNP (b) transistors.

So, let's get with it. I'm not going to cover any solid-state theory here, just how to use these things in something practical. Maybe we'll look at the theory some other time.

Your basic, garden-variety bipolar transistor has exactly three leads—emitter, collector, and base. You can find which is which for the particular part you're working with by checking the data sheet, but all transistors share two basic properties in normal operation. First, the current flowing from collector to emitter is some multiple of the current flowing into (or out of) the base lead. Second, the voltage drop across the emitter and base is constant. This applies only when operating in what's called the "active" mode, but we'll get to that in a moment.

Fig. 1 shows the two types of bipolar transistors: the NPN, (a), which is drawn with the arrow on the emitter pointing away from the base, and the PNP, (b), drawn with the arrow pointing in. As a general rule, anything you do with one, you can do with the other if you swap all your polarities—a positive supply becomes a negative supply, etc. Fig. 2 shows this. Here, the two transistors are shown with voltages set up between the three leads to put them in the active mode. (Properly arranging the voltages, currents, or whatever on a transistor or any other device is called "biasing," and that's what this article is all about.) For the NPN transistor to be active, the collector must be more positive than the base, which in turn must be more positive than the emitter. The PNP is just the same, but here the collector is more negative than the base, and so on. We'll limit our discussion to the NPN, but remember that everything will also apply to the PNP—just turn the voltages and currents around.

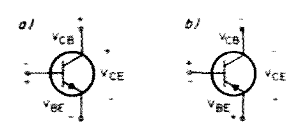


Fig. 2. The NPN (a) and PNP (b) transistors biased for the "active" mode of operation. Note that the only difference is the polarity of the voltages.

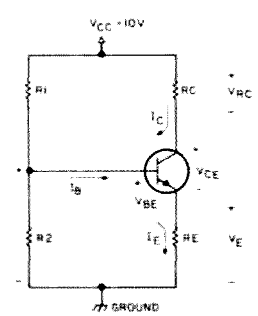


Fig. 3. An NPN transistor with a network of resistors for biasing.

The active mode of operation is the one most often used in linear circuits such as amplifiers, and in this mode the transistor is indeed acting as an amplifier. The current flowing into the collector lead is directly proportional to the current into the base lead. The other two modes possible are "cutoff" and "saturation." Cutoff is exactly what you'd think—the transistor is turned off and no current flows at all. This occurs when (for the NPN) the base is less positive than the emitter. Saturation occurs when the base is more positive than either the collector or emitter and means that the transistor is passing all the current it can for that particular biasing. (Note that saturation *does not* mean that the transistor is carrying its maximum rated current, only that it's carrying all that's possible for that particular setup.)

There's another way to look at the modes of operation we've just discussed. The transistor can be viewed as two diodes, one from base to emitter and the other from base to collector. (You can see it in the names

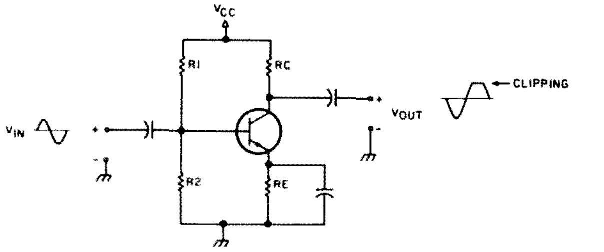


Fig. 4. A simple transistor amplifier. If the dc level at the collector is too high for the signal level expected, the output may clip as it tries to exceed the limit set by the supply voltage (Vcc).

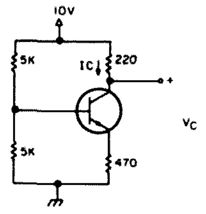


Fig. 5. The NPN transistor with some values for the biasing resistors. Ignoring beta, this circuit gives Vc = 8 V and Ic = 9.2 mA.

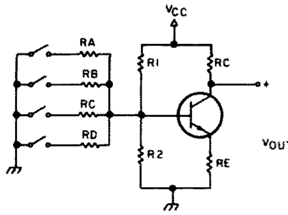


Fig 6. A simple digital-to-analog converter (DAC). As various resistors are grounded through their switches, the voltage through the base, and therefore the output voltage, changes.

NPN and PNP—two P-N junctions, or, in other words, diodes.) A transistor is active when the base-emitter diode is "forward-biased" (positive on the P side and negative on the N side) and the base-collector diode is "reverse-biased" (positive on N, negative on P). Either way, you can tell how a transistor is operating just by figuring out how the voltages are arranged around the three leads.

Fig. 3 shows an NPN transistor along with four resistors which we can use to establish the "dc operating point," in other words, to bias the transistor for proper operation. The dc operating point is usually specified in terms of the collector current and the collector voltage when no signal is applied. It's important because it will affect the operation of any circuit we build with the transistor.

For an example, let's suppose that the transistor is being used as an amplifier, as in Fig. 4. With the supply voltage (Vcc) at ten volts, the collector voltage will determine how far the output can swing before clipping. If, say, the collector is at 7 volts, we'd better not expect to get a signal out that swings any more than 3 volts positive—if it does, it'll run into the limit of the supply voltage and clip. This isn't the only way the operating point is important, but you can see that it's not something to ignore. On to biasing.

Remember the two points I made earlier: that the voltage drop from base to emitter is constant and that the current flowing in the collector lead is some multiple of the base current. The number you multiply the base current by to get the collector current is called *beta*. This may also be given as the Greek letter, β. Both of these will affect the operation of the transistor in any circuit, but beta is usually the more difficult of the two to handle. Not only will beta vary from part to part (sometimes by as much as five to one or more), but even the beta of a given transistor will wander around as the temperature, collector current, etc., change. Designing for a stable operating point for varying betas is really what biasing is all about. Now, some *practical* examples:

For our first try, we'll ignore the base current of the transistor and thereby ignore beta. This really isn't such an unreasonable thing to do since if beta is high enough (and most small-signal transistors sport a beta of at least 100), the base current really is negligible compared to the collector current. We'll use the NPN with a resistor network for biasing, as shown in Fig. 3. Now, if we ignore the base current, we can very quickly get some expressions for the currents and voltages in this circuit.

The point we're interested in is the collector—we want the voltage at the collector and the value for the collector current which is flowing through Rc. Obviously, by Ohm's Law, there must be a voltage drop across Rc of VRc = Ic × Rc, so the voltage at the collector is just Vc = 10 V − VRc. The emitter current must be the same as the collector current (we're ignoring the base current, remember?), so the voltage at the emitter (the voltage across Re) is VRe = Ic × Re.

Wait a minute! If the drop from base to emitter is constant, then the base will always be a certain amount more positive than the emitter. This drop is around 0.7 volts for a silicon transistor, so Vb = Ve + 0.7. Again, we're ignoring the base current, so Vb may be determined easily—R1 and R2 are just a divider, and Vb = 10 × R2/(R1 + R2).

Working backwards through the relations we discovered above, we can get the collector current (same as the emitter current) as Ic = ((10 × R1/(R1+R2)) − 0.7)/Re.

Fig. 5 shows the same circuit with some values for the resistors. Using the above formulas, we can find the voltage at the base to be Vb = 10 V × (5k)/(5k + 5k) = 5 V and the voltage at the emitter to be Ve = 5 V − 0.7 V = 4.3 V. The emitter and collector currents are then Ic = Ie = 4.3 V/470 = 9.2 mA and the collector voltage must be Vc = 10 V − (9.2 mA × 220) = 8 V.

If you build this circuit (any small-signal silicon NPN should work), you should measure voltages very close to the ones we just calculated. As a matter of fact, just using this type of analysis can allow us to design a practical circuit.

What would happen, for example, if we could switch the values of R1 and R2 around at will? One easy way to change this divider would be to put other values in parallel with R2, which will lower the resistance from base to ground. We might do this as shown in Fig. 6, with several different resistors tied together at the base and then individually switched to ground. A resistor whose switch is open would simply "float" and make no difference to the circuit whatsoever. Switching different combinations of resistors in and out would vary the voltage at the collector. If we chose the values of these resistors properly, we could use this circuit as a digital-to-analog converter, or DAC. DACs are used extensively to allow digital circuits, such as are found in microcomputers, to control analog voltages.

Fig. 7 shows a practical version of this simple DAC. As the binary representation of the numbers 0 to 15 is fed into the 74LS05 (a 7405 or 74S05 works just as well), the output (at the collector) will change in even steps from a maximum to a minimum value. If the DAC is driven by a counter, such as

the 74LS163 shown in Fig. 7, the process will repeat over and over again and the output will appear to be a "sawtooth" wave. With the values shown, the maximum voltage at the output will be around 10–11 V and the minimum 2–3 V. (These will vary somewhat due to part tolerances and variations in the base-to-emitter voltage.) The 555 timer provides the clock for the counter, here at about 16 kHz. The output frequency will be 1/16 of this value, or about 1 kHz.

If you build this circuit and have access to an oscilloscope, be sure to look at the signal on the base when the counter is running.

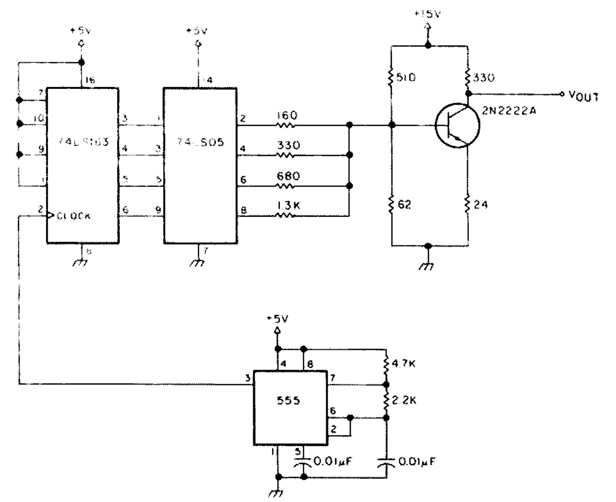


Fig. 7. The DAC used to generate a "sawtooth" waveform.

Notice that it appears to be a smaller, inverted version of the sawtooth waveform seen at the collector. Surprise! The transistor is really acting as a simple amplifier, taking the small signal we've made at the base and making a bigger copy of it at the collector. (The inversion of the signal is characteristic of this type of amplifier.)

You may want to try your hand at designing one of these yourself. First, a word of advice: This is never going to be a very classy way to make a DAC, and variations in the resistors or the transistor itself can, as noted above, cause the output to change from the designed value by quite a bit. But it's kind of fun to try these things for yourself, so here's how.

The 7405 is an inverter with "open-collector" outputs. This means that the output pin is simply the collector of a transistor, and when an input is high, this transistor is switched on and effectively takes the output (the collector) to ground—the transistor, in other words, saturates. It won't actually make it all the way to zero volts—there will always be some small drop across this transistor, around 0.2–0.3 V. We can assume about 0.25 V for the purposes of this design. Thus, a high input will pull the resistor associated with that bit to 0.25 V. The drop across the resistor is the base voltage minus 0.25 V. We start by setting up Re, Rc, R1, and R2 for the desired minimum output voltage at the collector. In this stage of the design, assume that all of the "extra" resistors are floating—they can be ignored.

With the minimum voltage established by the basic biasing network, we can add the extra resistor to pull the base voltage down and so increase the collector voltage. If you want to use a straight binary input such as the one shown here, calculate the value of the smallest resistance (the most significant bit of the input) first. This may be done by figuring what the base voltage needs to be for an output voltage that's halfway between the desired minimum and maximum—this *is* the most significant bit, remember? Given this voltage, the current through R1 is found by subtracting this base voltage from the supply and dividing by the resistance of R1. Since we're ignoring the base current, the sum of the currents through R2 and Ra must equal the current through R1, and so we find the current in R2 next. This is simply the desired base voltage divided by R2. Subtracting this current from the current in R1 gives the current that must be drawn by our most-significant-bit resistor, Ra. The value of Ra is just the drop across Ra divided by this current, or Ra = (Vb − 0.25)/Ia.

The remaining resistors may be calculated in a similar fashion, or for a straight binary DAC, each resistor will be twice the value of the one for the bit to the left. If we want a four-bit DAC, such as the one shown, and we calculate Ra to be 500 Ohms, then Rb = 1000 Ohms, Rc = 2000 Ohms, and Rd = 4000 Ohms. Use the nearest value available and use the most precise resistors available for best results.

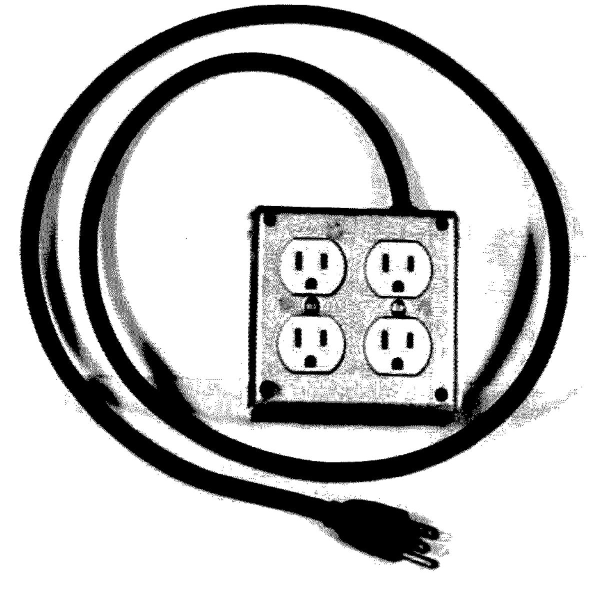
With this example, we've learned in a very basic way how the transistor may be biased to provide various desired levels at the output and even found a way to get it to act as a simple amplifier. But we haven't covered what's really going on with a bipolar transistor—the control of the collector current by changing the base current. In Part II, we'll look at this action and work beta into our analysis of just how this little piece of silicon acts. (Thanks to Richard Herrington for the suggestion for the DAC circuit.)■

Peter Doherty W1UO
PO Box 291
Port Townsend WA 98368

Yikes! Spikes!

You paid good money for that computer system. Now spend a few hours building an insurance policy against voltage spikes.

How many of you computer users are aware of the damage caused by voltage spikes present on the ac line? These little gremlins can scramble programs and destroy sensitive ICs. Commercial filters are available to alleviate these problems, but their cost can often exceed the price of your computer! So if you cringe every time the refrigerator turns on, or if you are unaware that this potential problem even exists, please read on. A little solder and an evening's work will produce a filter that will protect your investment at a fraction of the commercial cost.



This unassuming device could save you thousands of dollars.

Description

This filter will protect your computer from two types of interference: line transients and RFI. Transients have many sources. Inductive loads, such as motors turning on and off, will generate voltage spikes on the ac line. These spikes can be many times higher than the nominal 117 V ac. A nearby lightning strike can also cause a spike. Even turning your printer on or off can create a voltage spike. A subtle result of these transients can be information scrambled in the computer's memory or, more seriously, blown IC chips in your equipment.

To prevent these spikes from damaging devices on the ac line, three metal-oxide varistors (MOVs) are used. This device is a voltage-dependent, symmetrical resistor which acts like back-to-back zener diodes. The MOV normally presents a high impedance across its leads. However, when a voltage spike is present, the impedance of the MOV becomes very low, providing a conducting path for the spike energy. The MOV can handle surges of up to 4500 Amps at 175 volts. An MOV is used across the line and from each leg of the line to ground. This will shunt damaging spikes away from sensitive equipment.

One word of caution is in order here. An MOV that is exposed to an extremely high energy pulse can overheat and shatter. You could protect each MOV with a ten-Amp fuse in series with it, or omit the fuses and house the MOVs in a box to protect yourself in case of this unlikely event. I chose to allow the MOVs to self-destruct in their duty of protecting my equipment. An

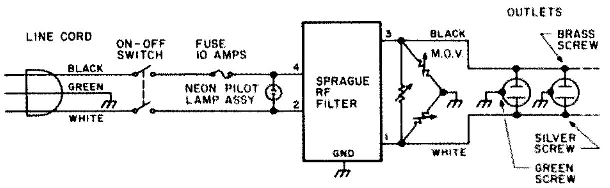
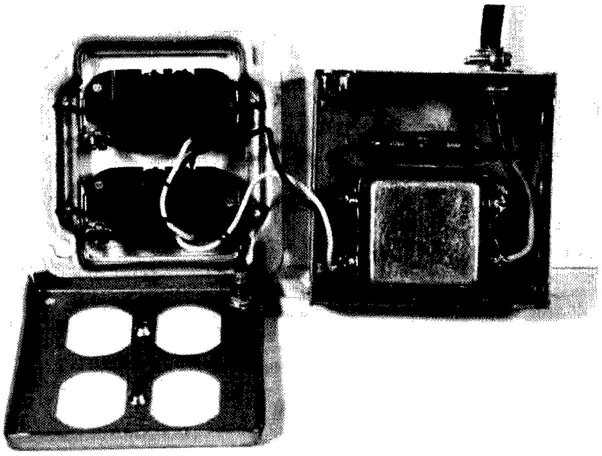


Fig. 1. Schematic diagram of the filter.

Parts List

Metal-oxide varistor	RS 276-570	3 @ $ 1.59
Rf filter, 2 × 12 Amps @ 250 V ac	Sprague JN10-2296A1, from Fair Radio Sales Lima OH	3.95
Line cord	W14-3CG, from Fair Radio Sales	2.00
Pilot lamp assembly	RS 272-707	2.19
DPST switch	RS 275-1546	2.69
10-Amp fuse holder	RS 270-739	.79
4" × 4" × 3" metal box	hardware store	1.69
Box extension ("mud ring")	hardware store	.39
Romex connector	hardware store	.20
Duplex outlets	hardware store	2 @ .39
Outlet cover	hardware store	.99
		$20.44



Inside the filter. The outlets are mounted on the box extension.

MOV is still far cheaper than my computer.

Computers are also affected by radio-frequency interference, or RFI. Rf energy can enter the ac lines from your transceiver, a nearby lightning strike, or your neighbor's CB set. This stray rf can also wreak havoc with computer operation. Likewise, computers generate quite a bit of RFI themselves. This can show up as noise on your receiver or television set. An rf filter takes care of RFI coming *and* going. A commercial rf filter available at a very reasonable price is used. It is rated at 12 Amps, which is well above my modest current draw. In my case, a very poor picture on my monitor was completely cleared up using this device.

Construction

I housed my filter in a 4" × 4" × 3" metal box used in house wiring. A box extension, or "mud ring," is added to the front of the box so that the outlets will clear the rf filter. The filter and the fuse holder are mounted on the bottom of the box using 4-40 hardware. A Romex connector is used as a line-cord strain relief. The MOVs are soldered directly to the rf-filter terminals. The duplex outlets are screwed directly into the box extension. All of these details can be seen in the photographs. Since the filter is capable of handling 12 Amps, number 14 or larger wire should be used throughout.

For the best protection and for safety's sake, the green wire (grounding wire) must be *securely* fastened to the metal box. DO NOT OMIT THIS! If something should happen and a live wire comes in contact with the metal box, the green wire will cause the fuse to blow. Don't let sloppy twelve-volt construction habits leak in. This is 110 volts ac and can be *deadly* if mishandled. Likewise, the ground screws on the outlets and the rf-filter ground should also be securely fastened to the box. If your house still has the older two-wire outlets, I suggest building this filter in a plastic insulated box to eliminate any shock hazard.

Also, pay close attention to the black and white wires of the line cord. Be *absolutely sure* that the proper color wire of the line cord makes it to the appropriate screw of the outlet. The white wire should eventually end up under the silver-colored screw of the outlet. The black wire should end up under the brass-colored screw. Don't get your wires crossed! If you have any doubt, consult your local electrician. Using the schematic, wiring should take but a few minutes.

Checkout and Operation

Using an ohmmeter on the high range, measure the resistance between each of the two pins on the outlet and ground. The reading should be infinite. The reading between the two pins of the outlet should also be infinite. Next, measure the resistance between the ground pin of the outlet and the case. The reading should be zero. Finally, check for continuity between the white wire of the line cord and the silver screw of the outlet. Ditto for the black wire and brass screw. Make sure that these wires are not crossed!

Your computer and disk drives should be plugged into the filter. Your monitor and printer should be plugged directly into the wall outlet. That's all there is to it! Now, when an unannounced spike arrives at your door, simply shrug it off and keep on computing.■

✓ See List of Advertisers on page 80

Give Your Micro the World

There's no voodoo involved in analog-to-digital conversion. In fact, here's a project for your TRS-80 that uses only two chips!

Mike Avery AI0Z
315 Logan
Roland IA 50236

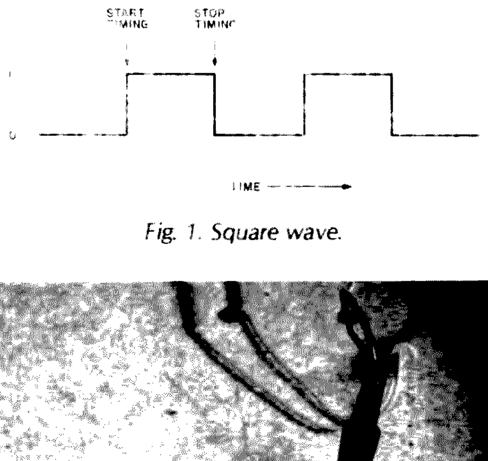
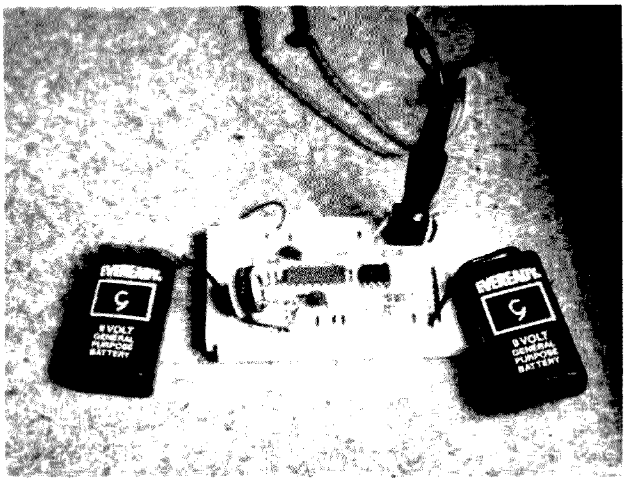


Fig. 1. Square wave.



The completed unit.

Home computers are used for many applications, from balancing checkbooks to defending civilization from the Klingon Empire. All of these programs have a common characteristic: Important data must be included in the program itself or entered from the keyboard. Manual data entry is tedious for long lists of data and impossible for voltages and other analog measurements that occur in real time.

The usual method of entering an analog value into the computer is the analog-to-digital integrated circuit (A/D) which converts a voltage to a digital word that can be read by the computer. This approach has several disadvantages. First, a rather complex integrated circuit is required to do the conversion. Second, the output of the A/D must be passed on to the computer through an 8-bit I/O port, which requires another complex IC. Third, the expansion bus on the computer is tied up with the I/O port and is not available for other applications (such as a RTTY terminal).

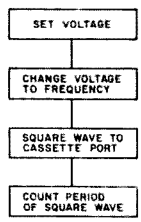


Fig. 2. A/D function flowchart.

The advantages of A/D circuits will be discussed in the conclusion section of this article. The capability for a simple A/D converter can be implemented on the TRS-80™ Model III microcomputer using only two ICs and the cassette port. The remainder of this article will describe the basic approach used and the hardware and software to construct a simple computer voltmeter.

Basic Concept

The cassette port on the Model III TRS-80 microcomputer is available as an input

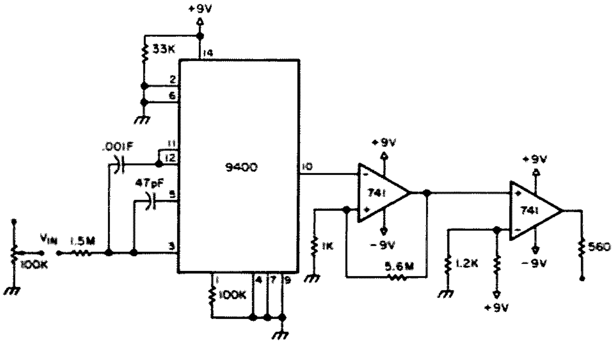


Fig. 3. The circuit performing the voltmeter functions.

```
00100              ORG      65400
00110 PORT         EQU      0FFH
00120 START        XOR      A
00130              LD       HL,0H
00140              IN       A,(PORT)
00150              AND      01H
00160              LD       E,A
00170 STATE1       IN       A,(PORT)
00180              AND      01H
00190              CP       E
00200              JR       Z,STATE1
00210              LD       E,A
00220              XOR      A
00230 STATE2       INC      HL
00240              IN       A,(PORT)
00250              AND      01H
00260              CP       E
00270              JR       Z,STATE2
00280              JP       0A9AH
00290              END
```

Program listing 1.

or output device and can be accessed with the Basic command INP(x) or OUT(x). The data obtained from the cassette port is in binary format, that is, either a 0 or a 1, seemingly not very useful in measuring an analog signal. However, if the signal into the cassette port is a square wave, as illustrated in Fig. 1, then more useful data can be obtained.

If the time that the input port is in the 1 state can be measured, then the period (P) of the square wave (and frequency, since f = 1/P) can be determined. To use the cassette port to measure a voltage, the signal must be changed to a square wave with a frequency that is proportional to the voltage. Fortunately, an integrated circuit exists, the 9400 V/F converter, which is designed specifically for that function. The concept used to implement the A/D function is given in flowchart form in Fig. 2.

Hardware

The circuit that performs the hardware functions of the simple voltmeter is shown in Fig. 3. The heart of the system is the 9400 voltage-to-frequency (V/F) converter. This chip can be wired for a variety of applications including V/F, F/V, a frequency-shift keyer, and more. In this application, the input voltage is converted to current by the input resistor and sent to pin 3. The output at pin 10 is a square wave of about 50 mV. This signal is boosted to approximate TTL (0-5-V) levels by the first section of a dual-741 operational amplifier. The second section is used to produce a waveform symmetrical about zero, which is required by the Model III

```
10 CLEAR:DIM DA(30),DT(30),DB(30),TX(30),TY(30)
20 FOR I= -136 TO -108: READ X:POKE I,X:NEXTI
30 DATA 175,33,0,0,219,255,230,1,95,219,255,230,1,187
40 DATA 40,249,95,175,35,219,255,230,1,187,40,248,195,154,10
50 DEFUSR1=&HFF7B
60 CLS
70 NO=0
80 '
90 '
100 INPUT" ENTER VOLTAGE (-1 TO EXIT)";E
110 IF E=-1 THEN 180
120 NO=NO+1
130 DB(NO)=E
140 GOSUB 310
150 DA(NO)=DA
160 GOTO 100
170 '
180 FOR I=1 TO NO:TX(I)=DB(I):TY(I)=DA(I):NEXTI
190 GOSUB 340
200 '
210 CLS
220 PRINT"POWER CURVE CONSTANTS ARE:  A=";A0;"  B= ";B0
230 INPUT"SET VOLTAGE AND HIT <ENTER>";T$
240 GOSUB 310
250 T1=LOG(DA/A0)/B0: V=EXP(T1)
260 PRINT"VOLTAGE = ";V
270 GOTO 230
280 '
290 '
300 A=USR1(X):RETURN
310 SUM=0:FOR I2= 1 TO 10: GOSUB 300: GOSUB 320: NEXTI2:DA=SUM/10:RETURN
320 SUM=SUM+A:RETURN
330 '
340 '    *** SUBROUTINE TO DO LEAST SQUARES FIT ***
350 '
360 '     DATA IS INPUT AS ARRAY TX() TY() AND NO AS # OF VAL
370 '
380 Z=0:Z1=0:Z2=0:Z3=0
390 FOR IO=1 TO NO
400         Z=Z+ LOG(TX(IO))
410         Z1=Z1+ LOG(TY(IO))
420         Z2=Z2+ (LOG(TX(IO)))[2
430         Z3=Z3+ (LOG(TX(IO)))*(LOG(TY(IO)))
440 NEXTIO
450 '
460 '
470 '       NOW  CALCULATE POWER CURVE CONSTANTS
480 '
490 A0 = Z1/NO-(Z*Z3-Z[2*Z1/NO)/(NO*Z2-Z[2)
500 B0 = (Z3-Z*Z1/NO)/(Z2-Z[2/NO)
510 A0 = EXP(A0)
520 RETURN
```

Program listing 2.

cassette-input circuitry. The 100k-Ohm potentiometer is used to provide an input voltage for testing or offset.

Any construction technique should work as long as neatness and minimum-lead-length guidelines are followed. Two 9-V transistor batteries are used for the power supplies and should provide many hours of operation. One disadvantage of the 9400 IC is that the input voltage and output frequency are related by a power curve. This problem can be solved by using software.

Software

The programs needed to implement the computer voltmeter are straightforward. A short machine-language routine that counts the period of the square wave is given in Program listing 1. The important parts of the program are the two loops, marked by STATE1 and STATE2. The first loop waits until bit 0 of port FF (the cassette port) changes state. The second loop tests the port for the same condition but increments a counter before each test. The final count is passed back to a Basic program using a statement such as A = USR(x).

The Basic Program listing 2 first POKEs the machine-language program into the top of memory (48K machine) and sets the disk Basic USR address. For a 16K non-disk system, the following lines should be changed:

```
20 FOR I=16351 TO 16380:
READX:POKEI,X:NEXTI
50 POKE 16526,223:
POKE16527,63
300 A=USR(X):RETURN
```

Don't forget to protect the upper memory before running the program (use a value of 65400 for the disk version and 16300 for the 16K version).

The relationship between the measured period and the input voltage is nonlinear and follows a power curve, that is, a function of the form: period = a*(voltage)exp(b).

The program starts out by acquiring a number of calibration points. The voltages can be obtained using the potentiometer shown in the circuit diagram. The best results were obtained when calibration voltages were from 0.5 V to 2.5 V in about 0.25-V increments. Line 220 prints the constants on the screen and lines 230 to 270 are used to calculate an unknown input voltage.

Since the V/F relationship is a power curve, voltages at the high and low ends of the 9400's range are not measured as accurately as values in the middle of the range. When input voltages were held to the range mentioned above, measured unknown voltages were within ±10% of the actual values. Input voltages can be kept within those limits by adding a 0.5-V offset voltage to the input (using the potentiometer) and limiting the input to 2.0 V using voltage dividers or operational amplifiers.

Conclusion

By no means is this circuit designed to be a high-accuracy A/D. The main thrust of this article has been to illustrate how an A/D converter can simply and with very little effort be added to a computer system. The nonlinear response of the system limits its accuracy. Traditional A/D converters are linear, provide better accuracy, and can be much faster.

This is not to say that this application is worthless! The number of potential applications is limited only by the imagination. For example, the output of a weather station could be monitored and weather data plotted out. The system also will provide a useful addition to the computerist who wishes to dabble in hardware interfacing. ■

W2NSD/1 NEVER SAY DIE

editorial by Wayne Green

from page 4

And remember that with Reagan boss for four more years, we have to live with the mess we've made. And we've made the mess, not the FCC.

The Commissioners were right in their perception of the problem and probably right in their attempt to solve it. They just couldn't conceive that the League could be so blind as to destroy the hobby rather than let it grow.

I've talked with most of the Commissioners at length and what has happened is not the result of any misunderstanding. They understand amateur radio better than most amateurs and my hat is off to them for doing their homework.

They recognize that today amateur radio is no longer providing the services for which it was chartered (see 97.1). They see it, all too clearly, as a small elitist group of aging men, largely retired, who want to preserve their fun and keep newcomers out.

They know our incredible past record of inventing and pioneering new modes of communications, but they also know that this aspect of the hobby died out twenty years ago when the League proposed to take away phone privileges from 85% of the hams.

For twenty years the hobby has lived on its old glory. Now amateur experimenting and pioneering are virtually dead. Indeed, this is the realm of the younger ham, not the old-timer, and we have almost no young hams these days. Just go to a hamfest or a club meeting and you'll see for yourself.

The lack of youth on our bands has helped to develop cliques among the old-timers. Today we hear foul language on our bands that was completely unknown twenty years ago. We hear organized groups of jammers on service nets and repeaters. Indeed, you'll be hard put to find CB anywhere in the country as bad as some of the stuff we hear on our ham bands.

Complaints to the FCC? Make me laugh! They now taunt us with our once proud claim of being the number one self-policing radio service. Old men don't seem to have much fighting spirit, so when another cranky old man gets on the air and louses it up, the first old man just turns his rig off and calls the FCC, only to find they really don't care. Youngsters would get their bile up and make it their business to do something about it.

How many of you reading this can remember when you had pride in being an amateur? We were damned good communicators! We built ham gear and we had a ball. I built my first narrowband FM rig back in 1948 and helped pioneer that new mode. I got fascinated by digital communications then and built my own RTTY equipment. *73* was founded on the basis of helping hams to design and build new equipment—to cope with the changing technology. We were in there first with SSB and then with solid state. What magazine made repeaters happen as a world phenomenon? If you don't know, it was *73*, and with zero help from any other magazine.

Now what do we build? What have *you* built lately? Are *you* on OSCAR? Are *you* on RTTY? Packet radio? Are *you* going to try spread-spectrum?

Sure, there are a few old-timers who have devoted their lives to getting QSL cards from over 300 countries. A fat lot of karma in that! What a waste of a life! That's no more valuable than going to your grave knowing the ratings of all the major-league players. Phooey.

Good karma? There's lots of it around. Just get some youngsters into our dying hobby, that's all. I've been to a couple of ham clubs recently giving talks and they were proud that they had chased all of the kids out. Bunch of old men all agreeing that no one should get a ham ticket without the code, yet most of 'em bitterly oppose any move to check to see if they still remember the code, which many don't.

Can your bunch of old fogies get a ham club started in a local high school? Wait until you hear all the excuses from OMs too busy for that.

No, the Commissioners were right on the beam when they decided that amateur radio had outlived its usefulness. Unless you personally do something which will help to change what is happening, all you are going to see for the next few years is one ham band after another going away.

Put yourself in their seat. Would you squander a public resource worth billions on a bunch of old men who are using it for a useless hobby? Heck, we aren't even a major market for ham gear—most of which is being made in Japan these days. We're just making the balance-of-payments situation worse.

Shall we have a short commemorative prayer for Hallicrafters, Hammarlund, Johnson, Gonset, Central Electronics, Harvey Wells, Webster, Swan, Galaxy, WRL, Sideband Engineers, Eldico, and Lakeshore Industries?

We haven't invented anything in twenty years. We are no longer of value as a source of trained technicians for the military in time of war. Tell me about international friendship—that is, if you can take your hand off the mike button in that pileup for a moment.

You, on the repeater, would you mind telling me again where you are located? That was the high point of your endless transmission and I was dozing off when you mentioned it—just before the jammer with the boring supply of four-letter words broke in.

I'm trying to get high-tech hobby clubs started in high schools. I've donated groups of computers to two local schools and they are both going great guns. High-school ham clubs don't even need equipment—all they need is encouragement and to have local hams come in and teach them the code and theory. They need a weekly meeting and pep talks about the excitement of the hobby. I'm involved in my town; how about you? Too busy?

Oh, I'm working on the national level, too. I'm on the advisory group for Senator Humphrey, I talk with the FCC Commissioners, I talk with Senator Gold-

water, and so on. How about you? Have you ever visited your Congressman and asked him to help get ham clubs into every high school in your state? Have you discussed this with your governor? I've talked my governor's ear off on the subject, and he's very interested. I've also talked with the governors of Vermont and Maine. How about you? What are *you* doing?

You'll find politicians interested in your ideas. They are so used to pressure groups coming to them demanding government support that someone asking for something which costs nothing is a novelty.

So there you have it. If you'll devote 5% of your hamming time to interesting youngsters, to getting a ham club going in your local school, to talking with your governor, congressmen, and senators, we could have our hobby moving ahead in a couple of years. If you don't, it could easily blow away in the same time.

Do you really think that the major communications firms are not well aware of how weak we are? They can make billions using our channels, so you better believe that this has their attention and that they are willing to spend whatever it takes to get rid of us.

It's up to YOU.

LETTERS

TV VIEWERS NOT DOERS

This is in response to your July, 1984, editorial on implementing a period of instruction time devoted to a "high-tech hobby club, amateur radio, computer, astronomy, whatever." You are implying that by simply getting our teenagers to participate in high-tech pursuits we could get the good ol' US of A back in step with the Japanese.

I agree with you that we must get our youngsters more interested in a field of science that would contribute to America's technological pool. But you can't expect American kids to get involved on the same level as the Japanese kids—mainly because they have a more effective educational system and American kids are more concerned over spending their time having fun rather than figuring out new ways to implement high-speed digital communications.

How many times have you turned on your TV set just in time to catch a bunch of beach-going teenagers advertising some soda pop, bubble gum, acne medicine, clothing, etc., all having a great time? (Or do you have time to watch the tube?) No wonder the American teenager is what he/she is today, a product of a society that seems to encourage having a good time, all the time. I guess having fun comes with the territory when you live in a prosperous nation. But so do the Japanese; how come they don't have the same problem? What have I been discussing for the last two paragraphs?

I am the trustee of an endangered species—a high-school ham club in the US. We are a newly-born organization, only two semesters old. I put notices in the campus bulletin, which is read every school day, a full semester before our club started, only to have the massive number of six students show up for our first meeting (three of whom stayed on, bless their hearts). We hold our meetings once a week after school for the reasons you mentioned in your editorial, lack of school support and money. I have donated much of my time and money, as well as my backup rig to the school station. I wrote several letters to major manufacturers of ham gear asking for donations of new, old, used, or repairable rigs, only to have one manufacturer reply saying how sorry they were that they couldn't help us. It is no wonder that amateur radio at the high-school level is almost nonexistent. We get no support from the school system or the private sector, and to top it all off the kids just aren't interested.

With that, I wish you better luck than I had in trying to interest our teenagers in a high-tech pursuit.

Erwin G. Viglila KA6WHM
Trustee, Amateur Radio Club
Mira Mesa High School
San Diego CA

LET'S FIGHT ABUSE

This evening I sat down to talk to my friends on 75 meters. Hoping for a pleasant time with a bunch of nice people, I was shocked by what happened. Some other people felt that we were conducting our QSO on "their" frequency—not an unusual situation. But before we could get anything resolved, we were showered with a torrent of abuse. Our colleagues managed to cover a broad spectrum of bigoted obsessions: easterners (actually we cover about a quarter of the country); the ARRL (about half of us are League members); the FCC (we do have licenses); the aged (we range from 21 to 80); Jews and Catholics (we represent all major groups, including clergy and agnostics); we also include a long list of racial and ethnic groups. We were accused of technical incompetence (actually a number of us are EEs) and general stupidity (several of us have doctoral degrees). And on it went.

Most of us scattered. I stayed on, trying to talk with these people. I hoped that if they met one of us as we are, they might be less likely to attack us as stereotypes. But this was not to be, for they gave me neither a reply nor even a callsign. And not long after, they left. It was as though without us there to abuse, they had no reason to be present themselves.

Of course, I was angry. I get on the air to get away from all this. I work as a psychiatrist in a children's hospital, and I often see abuse, rejection, and hatred. I suppose, as I must sometimes tell my patients, that there is no perfect escape. Still, it hurts. Like most feeling people, when I hear this abuse I become a member of all the groups being demeaned. I wish these bigots could realize how much pain their vitriol causes. Perhaps then, if they still possess some scintilla of humanity, they would desist.

Finally, I was and am concerned. This type of bigotry, which festers in certain segments of our bands, is a disgrace too few of us wish to acknowledge. I wonder what would happen if certain civic or political leaders, say an FCC Commissioner or two, were to overhear these antics. It might be hard for us to convince them that these operations represent only a small portion of us, that they are at variance with our hallowed traditions of fraternity and goodwill.

The real world has become much less acceptant of this garbage, much less willing to look the other way. Likewise, we amateurs, both as individuals and as members of our organizations, must summon the courage to recognize this problem—and to fight it.

William M. Klykylo, MD WA8FOZ
Cincinnati OH

STIRRED UP BY WAYNE

I don't recall ever having written a letter to an editor (or senator or whomever) before. However, as you say in your September, 1984, editorial, you like to move people off dead center. Well, I really don't know if I was on dead center, but you have caused me to do some thinking, which is what you like people to do, Wayne.

Anyway, the editorial speaks to the youth of today and, again, why you think there should be a no-code license. I saw a letter in the July *QST* hitting you again on this subject. Up until your September editorial I have held the opinion that the code should be kept, even though I am one of the ones that has trouble reading the code. I have kept my speed to my license level (Advanced), and although my brain does not seem to convert the code very well to the pencil, I am determined to get that Extra! But you see, Wayne, I now have a ten-year-old son and I have not been able to interest him in radio to any great extent. I have not pushed because I do not want to force an issue and totally lose. He's mildly interested, but at his age I was an avid BCL/SWL begging every Christmas for a "better radio." I finally got a used S-20R after many requests.

You went on talking about why you think the youth of today are not interested in radio, and I think you are right! But, sad to say, I don't have any suggestion either on how to turn even my own son around. My wife and I will do the best we can. We have none of the external problems you mention; it's just the way the youth of today seem to be.

As for the code and the Japanese, I now think maybe we do have need for another class of license for the youth. We also need to have a bit faster processing of the new licenses, as well. Back in 1954 I almost gave up waiting for my first ticket, and with all the computers, one would think the process would have been speeded up in the past 30 years. I don't think there should be any reason to take more than a week to get the first license from the FCC or whomever. I also think that we should have a spot in the HF range for them to get their feet wet—maybe 10 or 15 kHz on 80 meters.

Wayne, I haven't always agreed with your editorials or the way you keep digging up old bones about *CQ*, but I must admit you moved me off dead center. I haven't subscribed to *73* since the mid 70s when prices got out of hand. However, enclosed is $19.95 for my next 13 issues.

Do me a favor, keep the ARRL on their toes but bury the hatchet with *CQ*—it's the first one I got as a new ham, reading Wayne Green, and I still get it; it's a good rag and I enjoy it every month. I also get *Pop Comm* and I enjoy every page of that, also. I don't see them still at your throat (in the mag). But do keep us thinking. I feel Wayne Green is important to the amateur community. 73.

Mark J. Manucy W3GMG exW4FJE
Baltimore MD

DOESN'T MIND MONEY

I like your editorials! Not short, but certainly pointed.

Perhaps other publications of interest to amateurs ought to have a rambling editor; your column certainly allows for some steam-venting.

Anyhow, one point which you have made several times over the years is, I believe, more valid than ever—that is, the dearth of people connected with and participating in the exciting hobby of amateur radio who miss opportunities to turn their hobby into, you guessed it, MONEY!

More and more, amateurs in this country are turning into operators who know very little of the equipment they use—nor are they interested in learning the barest fundamentals of "all this fancy stuff."

'Tain't fancy at all! Same basic ol' circuits which have been around forever simply packaged in new packages. Smaller doodads doing exactly the same job as ever!

I have been a ham since my freshman year in high school (1953) and only recently has this "ignorance principle" turned itself into money.

It dawned on me that (1) there is still a lot of tube equipment still in use, (2) even more "new stuff" is coming on line, and (3) fewer and fewer hams repair anything.

With those astounding ideas in mind, a fairly broad technical education to back me up, and a few bucks invested here and there, I cranked up my money machine!

Gratifying, that, even operating part-time; there is a steady stream of broken things through the door, but it is *very* disturbing that there is little interest shown by hams in learning the technical aspects of their rigs!

I certainly don't *mind* putting their money in my jeans, but whatever happened to the roll-it and fix-it philosophy?

It is easier than ever to build quality equipment; sure the corner electronics-ham-parts place has largely vanished, but dear me, there is a veritable ocean of parts available by mail or from surplus!

Our society (even ham radio) is smack dab in the middle of a technical revolution, and no one seems to be heading for the action!

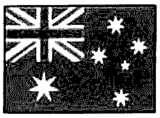
I may never become filthy rich, but I'm sure having a hell of a lot of fun! (Also forces me to say state-of-the-art!)

Robert Hall W6BSH
San Francisco CA

73 INTERNATIONAL

Each month, 73 brings you ham-radio news from around the world. In this collection of reports from our foreign correspondents, we present the latest news in DX, contests, and events, as well as keep you abreast of the technical achievements of hams in other countries.

If you would like to contribute to your country's column, write to your country's correspondent or to 73: Amateur Radio's Technical Journal, *Pine Street, Peterborough NH 03458, USA, Attn: Perry Donham KK2Y.*



AUSTRALIA

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Australia

HIGHLIGHTS FROM THE YEAR

Following are some of the highlights from over the last year or so with amateur radio in Australia, as stated by Mr. Bruce R. Bathols VK3UV, the 1983 WIA Federal President, in his report on the 1984 Federal Convention:

- The new Radio Communications Act was passed in both houses of Parliament (as of the date of this report, we are still awaiting the Act to be Proclaimed).
- An extra 28% tariff duty was levied on *all* amateur HF transmitting equipment.
- Then, the WIA successfully negotiated a new tariff bylaw to enable the import of HF, VHF, and UHF gear at a levy rate of only 2%.
- With respect to the new tariff bylaw provisions, the WIA has been appointed the overseeing body in determining the validity of transmitting equipment as coming within the scope of the new bylaw.
- The Federal President, Mr. B. R. Bathols VK3UV, and Dr. D. Warlaw VK3ADW attended the NZART Convention in Dunedin, New Zealand, in June, 1983. Our representatives returned with a wealth of information and saw the continuing need for constant liaison to be maintained between the two amateur groups.
- Phone-patch facilities were agreed to by Telecom. On the surface all appeared OK as far as amateur radio was concerned, but in depth there are several anomalies to be overcome. At least the matter has received some attention, and the WIA is continuing negotiations with the relevant authorities.
- *Amateur Radio* magazine continues to maintain its previous high standard; much support has been received from members. *AR* celebrated its 50th anniversary during the month of October, 1983, with a special edition.
- The WIA is fortunate to have had a representative at several meetings of the Standards Association of Australia (SAA) during the year, when matters of concern to the Amateur Service were under discussion.
- As well as the above, the Institute has (a) successfully negotiated for the return of 50.000 to 50.150 MHz to the Amateur Service, as a first step towards the return of the full 50.000-to-52.000-MHz segment; (b) provided input to the DOC for the *Interim Handbook for Operators of Stations in the Amateur Service*. The WIA is monitoring progress of the Radio Communications Act, ensuring involvement in discussions about drafting regulations pertaining to the Amateur Service; (c) obtained acknowledgement from the DOC (who have written to a number of other countries requesting the formalization of further third-party traffic arrangements); (d) secured further privileges for K calls on VHF and above bands, and (e) received acceptance from the DOC for an increase in the frequency of examinations for AOCP, AOLCP, and AONCP. It has been a very busy and successful time!

Membership and Services

- Despite a consistent number of amateurs entering the Service, membership numbers have actually shown a slight percentage decline. The reason for this is not really known, but we can assume that the 1982/3 economic policy has been a large contributing factor.
- Traditionally, we seem to lose about 10 percent of our members at the start of the new financial year. However, as has been the case over previous years, the membership numbers always seem to increase around the middle part of the year. A large portion of those members are, in fact, renewals from the past year.
- At the time of writing this report, however, the renewals are about 15 percent down from the trends for previous years. This is a serious situation, and it requires constant monitoring by the Divisions and Executive Office.
- We must come to grips with communication to our members, particularly the outlying ones.

TOO MANY REQUESTS

I, like other correspondents to "*73* International," am receiving many letters due to the great interest in this section of *73*. I have received up to 10 letters per week with requests for information and, with the upsurge in interest in Australia by Americans, most requests are for Australiana-type information, both past and present.

In the words of that immortal song, "I am only a common old working man—and when I get a couple of drinks on a Saturday..." Unfortunately, "working man" means 6 days per week and does not leave much time for chasing up information or requests, let alone those drinks on a Saturday night, and a lot of my drinking money goes on postage because up until now only one out of ten writers bothered to send an SASE. [*Ed. note to correspondents: Try to remember always to enclose IRCs for return postage with request letters sent abroad.*]

Trying to alleviate this problem and satisfy what is apparently a great demand for this type of information on Australia, I will, in the future, if an area I am writing about is of particular historical or present-day interest, try to satisfy the needs of those amateurs who don't have big beams or linears and cannot glean this information for themselves via the medium of amateur radio. Also, I will put a greater emphasis on background information than on some of the more mundane amateur-radio information in that area.

Amyr Khan Klink PY2KAQ at the launching of the Paraty.

BRAZIL

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Brazil

LONE BRAZILIAN HAM CROSSES THE ATLANTIC

Having left Luderitz City, Namibia, on the southwest coast of Africa on June 10, 1984, the 28-year-old Brazilian ham Amyr Khan Klink PY2KAQ is trying to cross the Atlantic Ocean alone in his 6-meter rowboat!

Not just any mad adventure, it is a long-planned scientific expedition sponsored by the Brazilian IAT-Companhia de Comercio Exterior (Exterior Trading Company), and was studied to its smallest details. Under the supervision of French radio-navigation specialist Maurice Uguen, who was the same to Willy Roos' "North Western Passage" to the Arctics, to Janusz Kurbiel and his polar expedition, and to the *Williwaw* on its next round-the-pole trip to Antarctica, this fantastic journey is raising tremendous worldwide interest.

An economist and President-Director to Paraty Investments, S.A., Amyr is an amateur skipper and navigator for high-sea races, a rower for the Esperia Club in Sao Paulo, did Hobie Cat 16 crossings from Paraty to Santos City in 1979 and from Salvador City to Santos in 1980, has sailed from Salvador to Fernando de Noronha Islands and to French Guiana in 1982 for Atlantic Ocean currents studies, and has canoed from Paraty to Ilha Grande Island and from Santos to Paraty.

This first-time-chosen route, 7000 kilometers long and requiring an estimated three months to cover, allowed for the Benguela, South Equatorial, and Brazil Currents between South Africa and the Brazilian coast—and also the southeastern winds, all aiming at Salvador City in Brazil.

The specially-constructed six-meter rowboat has food and water supplies for a five-month journey. Built of laminated cedar wood by late Alpha, Ltd., Shipyards in Rio de Janeiro, all plans and calculations were made by JCF Engineering, Ltd. It was taken to Ludertiz with everything on board except drinking water.

Absolutely unsinkable due to sealed compartments full of special plastic foam, highly resistant to shocks, with sun-power panels for battery charging, and a complete amateur-radio station aboard for communications, the rowboat, the *Paraty*, has two sealed cockpits and will always be upright. Even if strong waves or wind turns it over, liquid ballast placed under the waterline will right it.

Painted "rescue-yellow" above the waterline with metal radar-reflecting belts, it is painted under water with anti-fouling green and marine blue to avoid ce-

taceous attention. Batteries power the HF and VHF communications equipment, lights, navigation, and radar-detecting rigs.

A dehydrated-food program was supplied by Nutrimetal, S.A., under the supervision of technician Flora Lys Spolidoro, with 3800 calories per day being settled on as ideal; vitamins and mineral salts were included. Weekly consumption packages (seven daily-use packages in each) were numbered and subdivided for correct mealtimes so as to discipline meal consumption. Thirty days of extra food was provided for safety.

Physicians and a rowing technician took care of Amyr's physical preparation, check-ups, and evaluations at the Paciornick Hospital. Constant radio contacts with Dr. Edison Mantovani Barbosa, who was responsible for the pharmacy aboard, would provide all the support needed through PY2ARS, Alvaro's amateur-radio station in Sao Paulo.

Alvaro's antenna factory (ARS Electronica Industrial, S.A.) prepared the collapsible HF antenna for 15 and 20 meters with quick-change traps; HF equipment is a Kenwood TS-130; VHF equipment is a Brazilian Control, S.A., HT-type transceiver, 5 channels, and 0.1 or 2.2 Watts output, internal rechargeable battery; two extra battery chargers were supplied, too. Three VHF antennas, one fixed at the cockpit, a second telescoping antenna, and a Heliflex antenna provide this mode.

Together with the 275-liter-capacity tanks for drinking water, a rain-holding device at the cockpit, and two inflatable sun distillers, there was an experimental chemical salt-eliminator using an ion-exchange system (from the US Air Force).

As of now, Amyr has already traveled more than half the way. He keeps in touch with five Brazilian and French stations for weather predictions, information, and family news.

Any problem can be attended to through a parallel system of all equipment aboard. Each piece of equipment is numbered on a control map, so spare parts, repair materials, chemical compounds, medicines, or anything else for any emergency can easily be located. Instructions can be radioed to Amyr, with CW used as an extra backup.

Hand and buttock blisters were the first problems faced by Amyr after days of rowing, but Dr. Edison's attendance quickly stopped them.

Storms with seven- or eight-meter-high waves, sharks, and whales are "part of the show," Amyr says when QSOing.

During good weather, his daily routine includes some 8 or 10 hours of rowing, some rest each two hours, a close-to-8-hour sleeping period inside the cockpit, and the other hours on jobs like navigation, maintenance, radio skeds, kitchen affairs, and so on. During bad weather, when no rowing is possible, boat controlling from inside the sealed cockpit is the job, and a one-week-provisions package is provided in this place in case the second cockpit is too hard to reach.

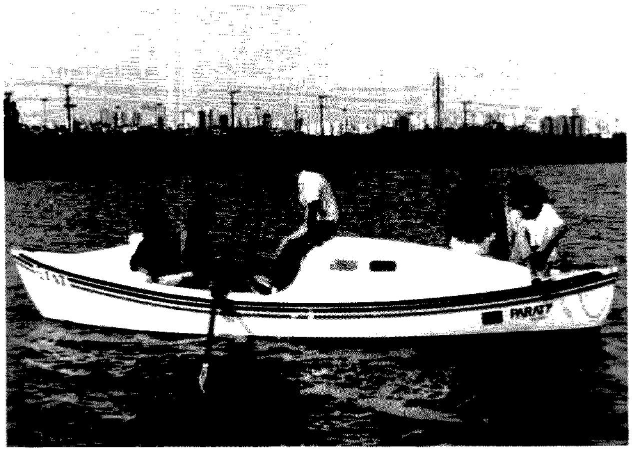
Daily jobs are all preplanned and must be carefully executed. Some jobs may become quite exciting, like removing coatings and small sea animals from the bottom of the boat—which slow the boat speed and, what's worse, attract fishes and then sharks to eat them. Swimming in the middle of the Atlantic Ocean is not a very pleasant idea, and sharks scratching the boat make for a rather uncomfortable sensation, Amyr says.

Considering the probable 109-day calculated duration of the journey, and having left Luderitz June 10, Amyr will have reached Salvador City in early October, and although the *Paraty* has already turned over some four or five times, everything is perfectly under control and going according to Maurice Uguen's predictions. The sealed-boat project approved by Maurice is the main cause for this successful expedition, and according to his analysis, Gerard D'Aboville's crossing from Cape Cod to Brest in 1980 and also Tom McLean's crossing, Newfoundland-Ireland in 1969, were also successful due to this fundamental point.

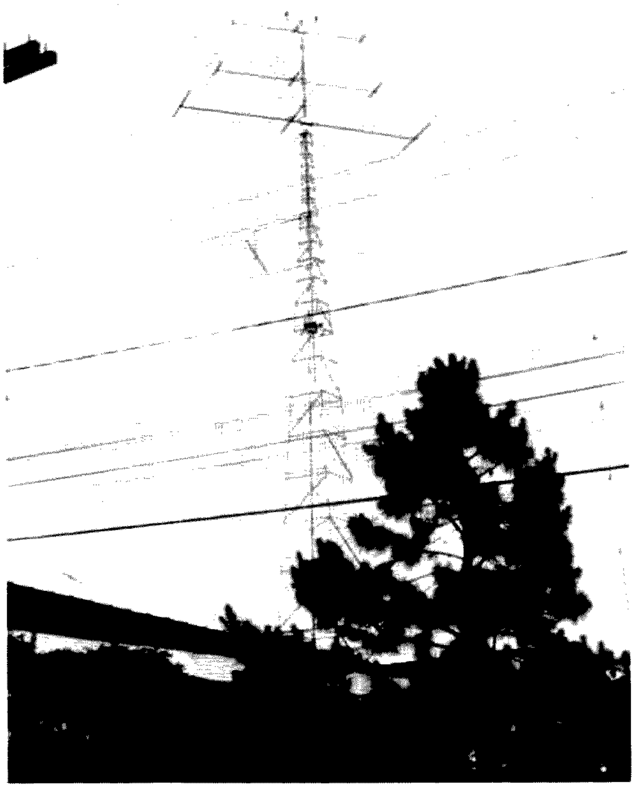
The *Paraty*'s arrival in Salvador will be just a question of time, and contacts through Brazilian Merchant Marine School's amateur station, PY1EMM in Rio, prove the efficiency of the organizer's team, so we're anxiously waiting for October's news, to celebrate this marvelous conquest of the Atlantic Ocean by our Amyr Khan Klink PY2KAQ!

Coordination of promotion data is under the supervision of Editeve Comunicacoes Ltd., in Sao Paulo.

August 30, 1984, note: Just got news Amyr is 1800 kilometers from the Brazilian coast at Bahia, and maybe he'll finish close to 20/30 September.



Amyr and friends getting the feel of Paraty*'s maneuverability. In the background is Sao Paulo City.*



The Christmas-tree beam antennas of Alvaro PY2ARS make QSOs with Amyr an easy and comfortable job.

CZECHOSLOVAKIA

Rudolf Karaba (OK3KFO ARC)
Komenskeho 1477
955 01 Topolcany
Czechoslovakia

CRC, PO Box 68, 113 27 Praha 1, Czechoslovakia, is giving these awards to non-European countries:

• *ZMT* (countries of the peace camp) This is given for contacts with stations in 39 regions according to the following list, irrespective of the bands or modes. The application should be sent to CRC with five IRCs.

OK1	UB	UP	YU
OK2	UC	UQ	YU
OK3	UD	UR	YU
HA	UF	Y	
LZ	UG	Y	
UA1	UH	Y	
UA2	UI	SP	
UA3	UJ	SP	
UA4	UL	SP	
UA6	UM	YO	
UA9	UN1	YO	
UAØ	UO	YO	

Districts in Y, SP, YO, and YU are differentiated by the last letter in the callsign. Three different numbers in the callsign are required.

All contacts since April 26, 1948, are valid.

• *ZMT 24* The same conditions as the diploma ZMT, but the contacts must be within a 24-hour period.

I have received several letters from the readers of *73* wishing to know about the structure and division of amateur radio's activity in Czechoslovakia.

The license can be obtained by every citizen of Czechoslovakia free of charge if he or she proves to have very good knowledge in operating as well as in technical activity. Or it can be also obtained by a foreign national asking for a license who is a license-holder in his own country. Following prefixes: OK, OL are used for radio hams.

OL is a private class for youths aged 15 to 19. They are permitted to broadcast on the 160-meter band on CW, with input 15 Watts, and on all UHF/VHF bands, CW/SSB also with input 15 Watts. Division of prefixes: OL1 to 7 Bohemia (Moravia); OL8 to Ø Slovakia.

OKs are divided into 4 classes: Class D can work only on the UHF/VHF bands on mode SSB/CW with input 40 Watts. It is not necessary for them to know telegraphy. This class is especially for equipment design engineers.

Class C enables one to work on the UHF/VHF bands on mode CW/SSB and also on shortwave bands in the range of 1750-1950 kHz (CW), 3520-3600 kHz (CW), and 28,100-28,200 kHz (CW). Knowledge of telegraphy *is* necessary.

Class B can work on all bands, on shortwave bands as well as on VHF/UHF, operating all modes with input 150 Watts.

Class A (Extra class) can work on all bands with input 500 Watts by all modes.

Division of prefixes: OK1—Bohemia (Czechoslovakia), OK2—Moravia, OK3—Slovakia, OK4—stations working on ships (sea/rivers), OK5 to 7—special stations, OK8—foreign nationals, OK9—special stations, OKØ—repeaters; OK1 to 3 are prefixes of general use.

Radio clubs can be operated by all holders of private callsigns as well as by operators without any private callsigns in the same classes as they were appointed (class A, B, C, D). These can work only in

radio clubs. Class C can be operated by operators who are older than 10 years. They are radio amateur transmitters. Besides that there are hundreds of technical clubs and groups of various technical interests. All the grants concerning accessories and TCVR are free of charge for radio clubs.

GREAT BRITAIN

Jeff Maynard G4EJA
10 Churchfields
Widnes WA8 9RP
Cheshire
England

After an absence of some eighteen months, I have just visited the United States again. This time I notched up my first visit to New York—and found most of the stories of the heat and humidity to be true (thank goodness for air conditioning). Unfortunately, from the tourist's viewpoint, I spent only twelve hours on the ground thanks to the Concorde.

I left London's Heathrow Airport at 1030 and arrived at JFK at 0930 for a full day's work. That same evening I departed JFK on British Airways' overnight 747 back to London. Not a great deal to do with amateur radio you might think—but I did manage to listen to a 2-meter scanner for about 15 minutes and heard something of the frenetic activity in that part of the world.

I had thought of trying to call in on a ham store before heading for JFK, but I realized that prices would no longer be competitive. When I bought my squeeze keyer and Bearcat scanner, the pound was worth $2.40—it is now worth barely half of that amount (around $1.30). It is probably cheaper to buy ham gear in the UK now for US tourists rather than vice versa.

I suppose most readers heard the Los Angeles Olympic Station, NG84O, sometime during the Games. I thought I would like a QSL from that particular station and noted the proposed operational periods of 1600 through 0400 GMT on all bands. That, of course, was a convenient time for European contacts, covering, as it does, the evening hours. However, despite several sessions listening just inside the US phone-band edges, I was unable to make any contact. Conditions do not seem to have been too good on the few occasions recently when I have ventured into the shack. I think I have mentioned previously that summer evenings and weekends tend to be reserved for playing golf. Most of my amateur-radio activity takes place in the winter (not because it's too cold for golf, but because it is too dark!).

Incidentally, you may like to know that a special UK Olympics station was planned to operate from the John F. Kennedy Memorial at Runneymede, near London. I did not listen for this station and do not know if it operated. But any readers with GK0JFK in the log not only worked it but have collected a good one for WPX! QSLs are via G3VIE (do you remember the first special station from Runneymede—WG3JFK?—I never did get my QSL confirmed!).

A glance at the recent issue of *Radio Communication*, the Radio Society of Great Britain's monthly journal, shows a continuing interest in the establishment of special-event stations. Some 15 to 20 such stations are established every month for a few days, each usually coincident with a particular public event or show.

Typical of these events are the Yeovil Festival of Transport (with the station GB2YFT), the Oldham Summer Show (GB2OSS), the Pontadrawe Folk Festival (GB4PFF), and the Pen-y-Fal Hospital Fete (GB2PYF). You will note that all of these special-event stations use GB prefixes—an ideal contribution to the WPX hunter. GB8 prefixes are also available for special-event stations, but operation is then limited to 144 MHz and above (making them an even greater catch for the US OSCAR operator).

The relatively long lead times involved in the preparation of these articles and subsequent publication in *73* preclude me from providing you with dates for special-event stations. However, I can give two dates for any reader planning trips to the UK. The RSGB Annual General Meeting will take place on the 8th of December at the IEE, Savoy Place, London. The RSGB National Convention (and exhibition) is planned for April 13-14, 1985, at the National Exhibition Center, Birmingham. Further details on either event can be obtained from the RSGB at Alma House, Cranbourne Road, Potters Bar, Herts. EN6 3JW, England.

The 1984 RSGB National Convention was again accompanied by the RSGB National HF Convention, which consisted of a series of lectures/discussions on a variety of topics throughout the day. I am much encouraged by reports that the most popular session (during which there was standing room only) was the Home Constructors Forum. This included lectures on PC-board production, test equipment, and construction techniques and was followed by a panel question-and-answer session. Let's hope for a return to home-brew gear rather than black-box purchasing as the norm.

Other topics covered during the convention included DXpeditions (including slides of trips to QJ0, VP8, ZB2, 9L, and OY), amplifiers, and general HF matters. The latter session was chaired by the RSGB's HF Manager, G3FKM, and included other well-known HF exponents on the panel. A good deal of the limited time available was spent discussing the merits or otherwise of the Society's decision not to allow trophy winners to take home their silverware for the coming twelve months!

ISRAEL

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Negev Mobile Post Office 85530
Israel

THIRD-PARTY TRAFFIC IN ISRAEL

For radio amateurs in North America, traffic handling is an essential part of the hobby. Indeed, in the US our hobby is known as the Amateur Radio *Service* for this reason. In other countries, where amateur radio is licensed by the same authorities who are responsible for the postal and telephone services, third-party traffic is unheard-of or severely restricted.

In Israel, we are somewhat more fortunate than many of our counterparts in the world. A number of years ago, Mark ZL1BMU stayed at our kibbutz for a few months and was delighted to run many phone patches to the States for members of our community. This task, often routine and rather a chore at times for us here, was a pleasure for him, as phone patching was forbidden in his home country.

Israelis have many relatives living abroad, and often for them amateur radio means a link with them. Thus, for many people here, the message-handling capabilities of ham radio serves as the *raison d'etre* of our hobby. More than one disgruntled neighbor coming to complain about the lines on his television screen, after having received a communication from his cousin overseas, has returned home with a smile on his face—having completely forgotten the TVI.

To date, Israel has third-party-traffic agreements with the following countries: United States, Canada, Great Britain, Austria, Costa Rica, Panama, Switzerland, and Luxembourg. I hope there will be more official agreements and more non-hams will come to better appreciate what we have to offer.

Phone patching, legally speaking, is actually a bit more complicated. According to the licensing regulations of the Ministry of Communications, only the holders of class-A tickets are allowed to let unlicensed persons operate their stations under their direct supervision. Thus, the Ministry says that only this highest-class licensee can let a non-ham speak over his station, and only class-A amateurs may install a phone patch. To further complicate matters, he may not install any old patch, but must have the device approved by the Ministry and pay an additional licensing fee, which is considerably more than the cost of his station license.

Nevertheless, there *are* 4X/4Z stations with phone patches, although relatively speaking they are few. Roughly, only 15% of Israeli hams hold the coveted grade-A license (that allows also the use of high power), and then only a fraction of these have a patch authorization.

In fact, it isn't much of a problem to find stations in North and South America who are willing to patch us through to telephone lines on their side. For many hams this has become routine and there are various nets and skeds that take care of the traffic handling.

The problem begins when stations abroad look for Israeli hams who can run a patch for them. As mentioned above, there are relatively few hams here possessing patches, and since they are scarce and the demand greatly exceeds the supply, they do not—how shall I say it—advertise themselves. A number of years ago, the Ministry of Communications was petitioned to allow grade-B licensees to connect phone patches, but to our dismay the Ministry refused to give in.

One other difficulty, it may be added, is the peculiarity of the Israeli telephone system, which is one of the most expensive in the world to subscribe to. There is no possibility of originating collect calls, so the amateur must dial at his own expense. He does partially get around this by explaining to the party on the other end of the line as briefly as possible what's going on and having him call him back.

When the war in Lebanon broke out in the summer of 1982, the wider Israeli public came to know what an asset amateur radio is to the country. With the outbreak of hostilities, thousands of army reservists suddenly found themselves called up from their civilian roles and in Lebanon with the advancing forces. Those of them who were hams had the presence of mind to pack their two-meter hand-held rigs, and it turned out that with the rapid pace of events, they were the only means through which their fellow soldiers could notify their anxious families that they were alright.

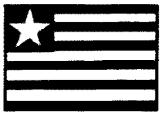
Other gear was put into action on forty-meter SSB, and along with the two northern two-meter repeaters, the airwaves were buzzing with messages day and night. In due time, the Army Communications Corps established means by which the troops could telephone out, happily putting the overworked hams out of business.

The Israel Amateur Radio Club received letters of appreciation from various units of the Israel Defense Forces, and for a while the media was full of stories dealing with amateur radio. Avi 4Z4AB, who handled over a thousand messages, was interviewed daily for a week on one of the local radio stations.

After all this, it was hoped that the Ministry of Communications would relax their regulations on the use of phone patches. No such luck. The only consolation was that none of those allegedly breaking the phone-patching regulations during that period were prosecuted.

There's an interesting side note to this, having nothing to do with the subject of phone patching. An Israeli amateur drafted into the IDF for the war noticed in one town in Lebanon a tribander on one of the houses. He knocked on the door, introduced himself as a ham, and had a very nice visit with the OD5 amateur who, for obvious reasons, will have to remain anonymous. Before leaving, he gave him his address in Tel Aviv and told him he was welcome anytime.

Imagine our friend's surprise when one evening, upon answering his doorbell, he found the Lebanese ham accompanied by two soldiers who had brought him. Many amateurs were invited over that night to meet the guest, and the next day his host took him for a tour of Tel Aviv and Jerusalem. Peace and harmony do not yet prevail completely in our region, unfortunately, but this story shows that amateur radio can form a bridge between people even under difficult times.



LIBERIA

Brother Donard Steffes, C.S.C.
EL2AL/WB8HFY
Brothers of the Holy Cross
St. Patrick High School
PO Box 1005
Monrovia
Republic of Liberia

AMATEUR RADIO IN LIBERIA

I am off the air, and for an amateur this is a sad situation.

There was an incessant tropical rain. There was no air moving and there was no sign of electrical activity in the atmosphere. This situation is quite normal in these parts during the rainy season. The rain just starts and stops—and sometimes it doesn't stop, at least so it seems.

I turned on the 40-meter rig for a scheduled contact with one of the mission stations up country. We said hello and gave each other a signal report. Then I said, "It's raining cats and dogs in Monrovia. Let's get this job done and pull the plug." Well, we did not finish and I did not need to pull the plug. I heard a distant rumble of thunder and my radio went dead. It was a power surge.

These things do happen, and I have been told that here in Liberia these power surges will, momentarily, take the voltage in a 120-volt line to over two hundred. That is bad, but the damaging effect of the surge is compounded by the fact that it is preceded by a dip in voltage that may be well over fifty percent.

When there is electrical activity in the atmosphere in the vicinity, power surges are normal in any electrical-power distribution system. Ac electrical power is a wave phenomenon and, as such, is subject to all the laws of wave motion. Sound waves, water waves, light waves, and any other kind of waves superimpose and add algebraically. Electrical waves do the same, and the results are known as power surges. There is no electrical system that is immune. In countries that have the necessary resources, the community power system has built into it protective circuits which, in case of a severe power surge, open the circuit, shunt off the surge, and reestablish contact. During electrical storms, these momentary power interruptions are common.

Well, in this part of Africa, the power company is still trying to extend its lines to neighboring towns. They are working on the basics and there is no protection for the consumer. After an electrical storm we routinely change light bulbs that are blown.

Amateurs, of course, understand all this and many of them prefer to operate their radios on battery power, using the ac only for charging the battery. This is an effective way to protect a radio from line surges, but when you solve one problem, others arise, and in the last analysis one has to make a choice. There are advantages and disadvantages both ways.

In any case, my radio was in the transmit mode, operating at full power (100 W) when the surge came through the power line. This has to be the period when the circuit is most vulnerable. The radio itself, a TS-120S, was not damaged. The power supply in use at the time, the Astron VS-35M, was showing an output voltage of zero. I checked the four rectifying diodes. They checked out OK. Sparing you all the details, we (I and some other amateurs) concluded that the IC unit was burned out. It is not available here. We studied the circuit and made a list of parts which might need replacement. A kind American amateur whom I have never met in person is gathering these parts and will mail them by air. I would like to write his call letters for everyone to read, but in a sense so doing would be a disservice to all the other amateurs. Amateurs help each other and help others. Since I have been in Africa, I have learned more than ever the truth of that statement. I have thought many times that it would be well to write an article, "The American Amateur Seen From the Outside," or some such title. Probably it would be trite and redundant—maybe not.

However that may be, thanks again to the good American amateur, my TS-120S will be back on the air in a couple of weeks. For my part, I have learned another lesson. The book says, "Unplug the radio when not in use." In the future I will not plug in my radio during one of these tropical squalls.

HAM HELP

About three years ago I built a CMOS digital thermometer out of *Popular Science* magazine. The probe uses a Texas Instruments 6.8k Tm-1/4 sensistor with a positive temperature coefficient. I haven't been able to find this part—can anyone help?

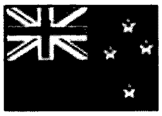
David Shoaf WD4CZW
Rt. 5 Box 375
Mocksville NC 27028

Just a note to some of the readers concerning "Ham Help." If someone sends you the information you need, please send an acknowledgement back to that person, perhaps including the postage. After all, he or she went out of the way to find and copy the material for you.

I don't know how many people respond to these requests for help, but in April I mailed 78 pages of information to 7 different hams. Only one person, a teacher, returned a note of thanks. In January it was 5 sets of information—with no replies.

I'll still send the stuff out, but I wonder what happened to the spirit of amateur radio?

J.Y. Lem KB8BO
5222 Coringa Drive
Los Angelas CA 90042



NEW ZEALAND

D. J. (Des) Chapman ZL2VR
459 Kennedy Road
Napier
New Zealand

This month I thought I would try to give *73* readers a brief summary of the economic position in New Zealand at the basic level and relate that to amateur radio. All figures are in New Zealand dollars (which are equal to about $US0.48 each).

The average basic weekly wage for a qualified tradesperson is somewhere in the region of about $210/220 per week, or $10,920/11,440 per year. The tax rate for this group of New Zealanders is 31.5 cents on the dollar, or between $65.10 and $68.20 per week, reducing the take-home pay to $144.90/151.80 per week.

Land tax on real estate owned is somewhere between $500 and $1000 per year, depending on the location of the property. Indirect taxation in the form of a government sales tax is added to about 50% of the goods we consume, and this sales tax is in the region of 20–30% of the wholesale price of the goods. Another comparative price is that of petrol (gasoline), the ZL motorists paying $4.00 per gallon for premium grade (or $0.89 per liter as we buy our gas since going metric).

Those of us interested in amateur radio are amongst the most affected when the cost of our radio equipment is compared to that of some overseas countries, the customs duty and sales tax being an additional burden hams have to put up with to follow our hobby. For instance, an antenna-tuning unit produced by MFJ, retailing in the US at $US139.95, sells retail in ZL for $NZ459.00. (The direct conversion of the US price to New Zealand currency is about $NZ291.00, the difference being made up by customs duty and sales tax.)

The New Zealand prices for a sampling of amateur equipment are as follows:

IC-02A	$450.00 (approx.)
IC-751	$2280 (approx.) with built-in power supply and desk mike
Yaesu FT-One	$4648 complete
TET HB33SP	$598.00

So, as readers can see from the sampling above, there is a difference when comparisons are made, but don't let this mislead you, amateur radio is still flourishing here in ZL despite the high costs involved. There are many proud owners of high-priced rigs, as the survey mentioned later in this column will reveal. The newcomer to amateur radio usually resorts to second-hand equipment for a start and then, when finances allow, graduates to a more modern new or near-new rig which is proudly described in QSOs or eyeballs at club rooms.

BITS 'N' PIECES

The Post Office has announced that there will be changes in the Amateur Operators Exam, effective September, 1984. Whereas previously the exam consisted of a combination of multiple-choice and short-essay-type questions plus the odd circuit to be drawn or commented on and a good knowledge of the Radio Regulations as they are written, the new-style examination will consist of 80 multiple-choice questions with only one correct answer, no circuits or essay-type answers, and the regulations portion will have more emphasis on the candidate's own explanation of the various regulations covering amateur radio. For these written parts of the A. O. Exam, a 50% pass mark is required for the Technician's grade-III license (non-Morse) and, of course, the 12-word-per-minute Morse test for the grade-II license.

Recently, NZART decided to make a membership survey to help the Council in planning for the future. The response to the survey was very gratifying, with over 89% of the survey papers being returned, and that's quite good for any type of poll. (As was expected, a few took umbrage at what they saw as an intrusion into their private business, and others were a little coy when it came to disclosing the true worth of their gear.) The following were the results in the various survey headings:

Age Distribution

Over half of our members (55.7%) are over 50 years of age, and three-quarters are over 40 (see Fig. 1).

Value of Equipment

This section was under two headings, Home-Brew and Commercial. The majority of home-brew equipment (67%) was valued at under $1000, whereas the peak (35%) for commercial equipment came at $3000. At the other end of the scale, only 1.6% of home-brew equipment was valued at $7500, and 1.4% of commercial gear was valued at $10,000 or above (see Fig. 2). Some proudly claimed all home-brew; others equally proudly, all commercial.

Planning Permission for Antennas

This section drew the fewest responses of all. Only 9.7% of those who answered this section have planning permission for their antennae.

TVI, BCI, and Other Interference

24.6% had experienced trouble in this area, and of that number just over half (53.5%) had consulted the Post Office Radio Inspectors, our regulatory controllers.

Financial Membership of a Branch

79.5% of those surveyed belong to Branches of NZART.

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1984 INDEX

MODIFICATIONS

ARTICLE	DESCRIPTION	AUTHOR	ISSUE
Better the R-70	modify the ICOM receiver	KE4AQ	Jun 54
Calculate Your FT-101	digital display and counter	VK8DE	Feb 22
Convert the Oddball			
Easy FSK for the IC-730	add what the factory forgot	WA4TTO	Sep 48
Hy-Gain Boards	CB boards move to 10 meters	N2DS	Feb 77
Messing with Heath	external vfo for the HW-101	A17C	Aug 46
New Orders for the R-109	low-cost surplus mods	K8AXH	Jun 70
On the Move with 10 FM!	quick mods for Comtronix FM80	W7AR	Jan 84
Quick Qwip Conversion Fax	restore surplus fax gear	KA9GDL	Sep 28
Watch a Warhorse Work	10 and 160 for the SB-221	W3JIP	Jul 48

NEW PRODUCTS

ARTICLE	DESCRIPTION	ISSUE
A5 ATV Magazine	Hamfest! game	Jun 91
Advanced Computer Control	ShackMaster	Jul 81
AEA	Doctor DX	Nov 76
AEA	MBA/Text	Jan 110
AEA	PKT-1 packet controller	Sep 85
Alpha-Delta	Surge Protector	Oct 100
Amateur Wholesale Elec.	EXL-5000	May 109
BHC	Big Ham Clock	Jan 110
Bird Electronic Corp.	4030 field-strength element	Aug 104
Break Communications	equipment console	Mar 109
Buccaneer	sealed connectors	May 109
Bullseye	FrameMaker clamps	Oct 100
BV Engineering	engineering software	Sep 86
Caywood	solid-state dip meter	Mar 109
CES	510SA simplex autopatch	May 109
CMC Communications	voice-operated squelch	Sep 86
ColoRadio Research	900B RTTY/ASCII/CW terminal	Jul 80
Com-Rad	Untenna	Jun 90
Connect Systems	CS-16 touchtone decoder	Jul 81
ContactEast	1984 catalog	Jun 91
Crumtronics	Contender	Jul 80
Cushcraft	AOP-1	Oct 100
Cynwyn	HF antenna design software	Jul 81
Davle Tech	SA-4 desoldering station	Sep 86
Design Electronics Ohio	QSK 1500	Aug 102
Doppler Systems	direction-finding gear	Dec 65
Electronic Specialists	interference protection	Jun 91
Flesher	TU-1200 RTTY TU	Apr 117
Gilfer Assoc.	Guide to RTTY Frequencies	Jan 111
H. Stewart Designs	DX Hidden Asset antenna	Jan 110
HAL Communications	AMTOR-10A	Dec 65
HAL Communications	PCI-2000 IBM RTTY interface	Nov 76
Ham Industries, Inc.	PA-25 2-meter amp	Jan 111
Hamtronics	COR-3	Dec 66
Hamtronics	GaAsFET preamp	Jun 90
Hamtronics	outdoor scanner antenna	Oct 100
Hamtronics	1984 catalog	Apr 116
Heathkit	HD-3006	Dec 65
Heathkit	HD-8999 keyboard	Aug 104
Heil, Ltd.	EQ300	Mar 108
ICOM	IC-HS10 headset	Mar 108
ICOM	IC-02AT	May 109
ICOM	IC-27H	Oct 100
ICOM	IC-37A	Jul 80
ICOM	IC-471H	Sep 86
Info-Tech	M-44 AMTOR converter	Sep 85
International Crystal	FOT-12 alignment oscillator	Mar 109
ISS	Halon extinguishers	Nov 77
J.L. Industries	Ham-Antuner	Oct 100
Jensen	1984 catalog	Nov 76
John Vesty Co.	VIC-20 Hamware	Jun 90
Kikusui	5060 60-MHz oscilloscope	Jul 80
Larsen	CM-series cellular antennas	Jun 90
Larsen	NMO antennas	Oct 100
Lowrance Electronics	System 70	Feb 86
MCM Electronics	1984 catalog	Aug 104
MCM Electronics	Tenma DMM/DCM	Jun 91
MEC	Unimec modular switches	Apr 116
MFJ	MFJ-407 keyer	Dec 64
MFJ	MFJ-1423	Mar 109
Micro Logic	design reference card	Dec 66
Microperipheral Corp.	modem jack	Oct 100
Microtec	50DC1235 dc-to-dc converter	Jan 111
Moler Antenna	E-field displacement antenna	Jul 80
Mouser	dip relays	Dec 64
Nady	EasyTalk	Dec 65
NCG	7-21-50 transceiver	Jul 81
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P.C. Electronics	TC-1 Plus ATV downconverter	Feb 86
Palomar	FL-4 audio filter	Nov 77
Rabbitt Ware, Inc.	Tutorcode	Mar 109
Radio School	code and theory tapes	Sep 86
Regency	MX-5000 scanner	Sep 85
Regency	Z10 scanner	Apr 116
Robot	1200C SSTV scan converter	Nov 77
S.E. Corp.	eZ Board prototyping system	Jun 91
SEA	1612 antenna coupler	Apr 117
Simpson	1984 catalog	Nov 77
Smith Software	antenna design software	Oct 100
Software Protection	Copyrighter	Feb 86
Spectrum Communications	SCR2000X repeater	Nov 76
Spectrum Communications	TTC300 DTMF controller	Aug 102
Spectrum Projects	Voice Pak	Sep 86
TAU	SPC-3000 ATU	Dec 64
Telex/Hy-Gain	Ham-SP rotator	Mar 108
Telex/Hy-Gain	hot line	Aug 104
Telex/Hy-Gain	ProCom 352-IC headset	May 109
Ten-Tec	Century/22	Aug 102
Universal Electronics	RTTY Today	Apr 118
Wahl Clipper	Oryx soldering system	Apr 117
Yaesu	FT-757GX	Mar 108

POWER SUPPLIES

ARTICLE	DESCRIPTION	AUTHOR	ISSUE
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Control Your Mobile Power	reliable mobile power	KB5QZ	May 56
Me and My Stupid Old PMOS Converter	get -12 V from +5 V	WB1HKU	Apr 14
Wet Battery Quiz	do you know everything?	VE3AZX	Mar 92

RECEIVING

ARTICLE	DESCRIPTION	AUTHOR	ISSUE
Better the R-70	modify the ICOM receiver	KE4AQ	Jun 54
Crystal Microwave	microwave crystal receiver	WA4WDL	Apr 42
Modern-Eyes the S-Meter	add-on signal strength meter	Patterson	Jul 24
New Orders for the R-109	low-cost surplus mods	K8AXH	Jun 70
Painless Op-Amp Filter Design	step-by-step instructions	W4RNL	Apr 102
Take a Trip to Europe	European shortwave stations	Peterson	Apr 48
Wheeling and Dealing with Preamps	remote preamp switching	W8PMS	Apr 84

REPEATERS

ARTICLE	DESCRIPTION	AUTHOR	ISSUE
A Times Square Data Display	scrolling touchtone decoder	WA4TEM	Dec 8
Breakthrough in Boston	crosslinking interface	W1UKZ	Jan 10
Piggy-Bank Repeater Project	simple repeater controller	KT2B	Jun 42
Sound Off!	repeater beeper indicates received signal strength	K3JML	Jan 28
Strictly for FM Deviates	deviation meter for VHF	KA8OBL	Feb 36

REVIEWS

ARTICLE	DESCRIPTION	ISSUE
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AEA	MBA/Text	Aug 100
AEA	Doctor DX	Oct 82
B&W	AC1.8-30 antenna	Mar 102
B&W	AP-10 portable antenna	Oct 84
Base2 Systems	MUFPLOT	Sep 82
Bash Educational Services	Novice class syudy guide	Apr 129
Belden	9913 coax	Dec 68
Bencher	ST-2 paddles	Feb 92
Bilal	Isotron 40	Oct 83
Break Communications	equipment console	Nov 77
DX Enterprises	DX-1 propagation system	Sep 84
H. Stewart Designs	DX Hidden Asset antenna	Feb 92
Heathkit	SS-9000 transceiver	Jan 107
ICOM	IC-RP3010 70-cm repeater	Jul 82
ICOM	IC-271A	Sep 82
ICOM	IC-37A	Dec 66
ICOM	IC-751	Aug 101
Idiom Press	The Complete DXer	Apr 129
J.C. Labs	Action Monitor	Jan 108
Kantronics	AMTORSoft	Aug 100
Kantronics	Interface II	Nov 81
Kantronics	Introduction to AMTOR	Jan 108
Kenwood	TR-2500	Aug 101
Kenwood	TW-4000A	Jun 92
Mizuho	MX-6Z 6-meter hand-held	Nov 78
NCG	7-21-50 transceiver	Dec 67
N2NY	HamMaster tapes	May 117
Rawn Company	Plast-i-Pair	Mar 102
Regency	Z30 scanner	Jun 93
Santec	ST-144/uP hand-held	Jul 82
Sybex	Astronomy on Your Computer	Aug 101
Ten-Tec	4229 Antenna Tuner	Oct 81
TET	V/UHF discone antenna	Jan 108
Thompson Software	Morse-code translator	Jun 92
Yaesu	FT-726R	Nov 80
Yaesu	FT-980	Feb 90

RTTY

ARTICLE	DESCRIPTION	AUTHOR	ISSUE
AMTOR How-To	guidelines for operation	W2JUP	Aug 62
Easy FSK for the IC-730	add what the factory forgot	WA4TTO	Sep 48
Join the Packet-Radio Revolution - Part III	protocols and procedures	WA7GXD	Jan 36
Ntty Grtty RTTY	complete Sinclair RTTY	WB6GTM	Sep 38
Rampant RTTY	multi-speed dual-shift mailbox	KOWVN	Nov 50
The Terminal Terminal Unit	variable-shift TU	K3PUR	Apr 70

SSTV

ARTICLE	DESCRIPTION	AUTHOR	ISSUE
Color Computer SSTV			
Part I	complete color SSTV system	K6AEP/WB8DQT	Nov 10
Part II	adding FAX to the board	K6AEP/WB8DQT	Dec 18
Peak Your Picture with Home-Brew SSTV Gear	gray scale and color bars	Cikas	Feb 60

TEST GEAR

ARTICLE	DESCRIPTION	AUTHOR	ISSUE
Around and Around and Around	Q-meter for coil winders	N7APE	Jan 70
Calculate Your FT-101	digital display and counter	VK8DE	Feb 22
Creason's Do-It DVM	single-IC digital voltmeter	K6EW	Jun 26
Easy Berardi Building	.5 to 600 MHz counter	Berardi	Jun 10
Find Fault with Your Coax	time-domain reflectometry	K4IPV	Oct 10
Peak Your Picture with Homemade SSTV Gear	gray scale and color bars	Cikas	Feb 60
Penn's Two-Tone Gadget	dual tone generator	W1BG	Aug 21
Rx for Ailing Antennas	build a noise bridge	K4IPV	Oct 28
Strictly for FM Deviates	deviation meter for VHF	KA8OBL	Feb 36
Take the Two-Tone Challenge	two-tone generator for SSB	W8DCC	Mar 84
Tester Project: England '84	multi-use transistor tester	Penfold	Jun 34

ARTICLE	DESCRIPTION	AUTHOR	ISSUE
Watch That Signal!	simple signal monitor	W4RNL	Apr 20
THEORY			
Around and Around and Around	Q-meter for coil winders	N7APE	Jan 70
But I Know How to Solder!	basic soldering	WD4S	Nov 28
Counter-Productive Basics			
Part I	digital design fundamentals	K4IPV	Aug 40
Part II	problems in counter design	K4IPV	Sep 8
Digital Design: How to Interface ICs	connecting to the real world	K4IPV	Apr 30
Find Fault with Your Coax	time-domain reflectometry	K4IPV	Oct 10
Give Your Micro the World	A/D conversion for the TRS-80	AI0Z	Dec 44
Join the Packet Radio Revolution	protocols and procedures	WA7GXD	Jan 36
LEDs You've Never Seen	how they work	W5LFM	Mar 58
Op Art	using operational amplifiers	KC0EW	Feb 62
Perfboard and Soldertail?	pc board construction tips	W4RNL	Jul 42
Secrets of Nicads	the real truth about nicads	WB2FYW	Jan 88
Simple Parabolic Theory	dish design basics	OA4KO/YV5	May 52
Transistors: A Biased Approach - Part I	basic transistor theory	KC0EW	Dec 34
Try Low and Behold	are low antennas best?	W1GV	Oct 38
Wet Battery Quiz	do you know everything?	VE3AZX	Mar 92
When Darkness Calls	160-meter grayline prediction	VE7BS	Oct 66
Your Own Optoelectronic Anemometer	intro to optoelectronics	K3VDB	Nov 42

ARTICLE	DESCRIPTION	AUTHOR	ISSUE
TRANSMITTING			
Build the NASA Beeper	simple courtesy beeper for HF	KQ4G	Mar 88
Convert the Oddball Hy-Gain Board	CB boards move to 10 meters	N2DS	Feb 77
Top-Band Power Punch	kilowatt amp for 160 meters	WA0VNY	Aug 70
Watch a Warhorse Work	10 and 160 for the SB-221	W3JIP	Jul 48
VHF/UHF			
Another Eggbeater	two-meter omni	WD5DNL	Oct 48
Crystal Microwave	microwave crystal receiver	WA4WDL	Apr 42
Disco Du[illegible]?	HT headphones	N6CSI	Sep 36
Elementary, My Dear: Watts 'n' [illegible]	stripline V/UFH wattmeter	KT2B	Sep 14
How to Gain with PVC	world's cheapest 2-m quad	WB6BHI	May 37
Perfect Timing	multi-use repeater ID	VE2DWG	Sep 22
Piggy-Bank Repeater Project	simple repeater controller	KT2B	Jun 42
Simple Parabolic Theory	dish design basics	OA4KO/YV5	May 52
Sky Power	contacts via meteor-scatter	WB4CHZ	Mar 90
Stare-Way to Heaven	visit the Arecibo observatory	AJ0N	
The Big-Car Break-Down Beam	two-meter fold-down beam	N3BEK	May 46
Throw in TV	build a UHF helix	WA4WDL	May 64
Wheeling and Dealing with Preamps	remote preamp switching	W8PMS	Apr 84

HAM HELP

We are happy to provide Ham Help listings free, on a space-available basis. We are not happy when we have to take time from other duties to decipher cryptic notes scrawled illegibly on dog-eared postcards and odd-sized scraps of paper. Please type or print your request (neatly!), double spaced, on an 8½" × 11" sheet of paper and use upper- and lowercase letters where appropriate. Also, please make a "1" look like a "1," not an "l," which could be an "el" or an "eye," and so on. Hard as it may be to believe, we are not familiar with every piece of equipment manufactured on Earth for the last 50 years! Thanks for your cooperation.

I am a handicapped ham and would greatly appreciate any working equipment anyone would be willing to donate to set up a station. I have multiple sclerosis and have been taken off work so I have no money for ham equipment. Anything you send will be so greatly appreciated.

J. T. Statham KA5UKP
1506 Sheila Dr.
McComb MS 39648
(601)-684-9558

I need a replacement power transformer for an NCX-A power supply or the name of a transformer rewinder.

Joseph Karr KA5RKD
RR1, Box 579
Lakeview AR 72642

I would like to get in touch with someone who would be interested in setting up a repeater in Wisconsin Dells or the immediate vicinity. The repeater would not only be nice for hams who go there yearly, but also for hams traveling through the area.

Klaus Spies WB9YBM
6502 N. Oketo Ave.
Niles IL 60646

I have a Commodore PET 2001 and would like to hear from persons who have information regarding C-64/VIC-20 compatibility or who have a user's manual.

Dale Warner
815 Hwy. 190
Mandeville LA 70448
(504)-626-5801

I need information on how to improve the performance of the Drake R4-B, T4-X, and AC-4.

Walter Pereira da Costa, Jr. PY4ZO
Rua Daniel Xavier 414
PO Box 207
Araquari-MG Brazil 38440

I am looking for a schematic for a Sears Roadtalker-40 SSB/AM CB radio, model 663.38100050, for conversion to the ten-meter band. I will gladly refund copying charges and postage.

Bill Springer KC9YJ
4014 N. Grant St.
Westmont IL 60559

I have a 23-channel Midland 13-882C Citizens Band radio. I would like to convert it to a 15-meter CW rig, but I have no idea how to do this. Can anyone help?

Lawrence R. Barley, Jr. KA4ROY
1427 Byron Ave.
Ypsilanti MI 46197

I would like a schematic and service information for a Hewlett-Packard model HP-130B oscilloscope. I will gladly pay copying charges and postage.

Bill Springer KC9YJ
4014 N. Grant St.
Westmont IL 60559

I am seeking technical assistance in modifying the TX/RX switching speed of a Yaesu FT-101ZD for use on AMTOR.

Daniel Murray WA7YIC
1541 Oxbow Circle RR #11
Billings MT 59101

NEW PRODUCTS

MFJ-407 DELUXE ELECTRONIC KEYER

MFJ Enterprises, Inc., introduces the MFJ-407 Deluxe Electronic Keyer to its line of amateur-radio products. The MFJ-407 features iambic operation with squeeze-key, dot-dash insertion, and semiautomatic operation that provides automatic dots and manual dashes. The keyer also features a dot-dash memory, self-completing dots and dashes, jam-proof spacing, and instant-start keying.

Solid-state keying is provided for use with tube or solid-state transmitters. Front-panel controls include linear speed, weight, tone, and volume controls as well as on/off, tune, and semiautomatic switches.

Weight control allows you to adjust the dot-dash space ratio, thus making your signal distinctive to penetrate QRM. A tune switch keys the transmitter for tuning.

The MFJ-407 is rf-proof, has a built-in speaker, and uses a 9-volt battery (not included) or 110 V ac with an ac adapter (MFJ-1305.) The keyer comes in an attractive black aluminum cabinet with a black front plate. The unit measures 7 × 2 × 6 inches.

For more information, write *MFJ Enterprises, Inc., PO Box 494, Mississippi State MS 39762.* Reader Service number 480.

MFJ's electronic keyer.

MOUSER RELAYS

Mouser Electronics announces its entry into the relay market with a quality line of DIP reed relays, the ME431-2000 series. Their DIP-style packaging makes them completely compatible with in-line ICs, and the terminal patterns mate with standard 14-pin DIP sockets. They feature a stable transfer of low signal levels that minimizes interface buffering.

The relays are available in three standard contact forms—1A, 2A, and 1C. Their contacts are rated at 4 or 10 W, with switching currents of 0.3 or 0.5 A and a switching voltage of 30 or 100 V dc. They feature a minimum insulation resistance of 10^{10} Ohms and a maximum operation/release time of 1.0 ms.

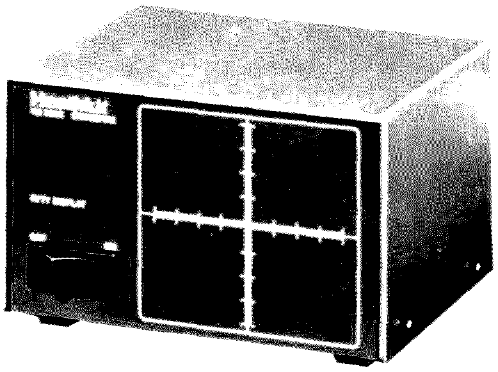
For further details and for a free catalog, write or call *Mouser Electronics, 11433 Woodside Ave., Santee CA 92076; (619)-449-2222.* Reader Service number 476.

TAU SPC-3000 ATU

TAU Systems, Ltd., has announced a new addition to their line of antenna-matching units. The SPC-3000 ATU uses an infinitely-variable roller inductor and 5-kV air-dielectric capacitors arranged in an SPC configuration. A built-in 4:1 balun, rated at 1 kW, is also included.

The front panel sports a counter for the roller inductor, a five-position antenna switch, and two meters—one monitors forward power, the other swr. The unit will

The Tau SPC-3000 ATU.



Heath's RTTY tuning aid.

operate continuously from 1.5 to 29.350 MHz, and is rated for full legal-limit power.

For further details on the SPC-3000 or TAU's complete line of parts and kits, contact *TAU Systems, Ltd., 51 Greenhey Place, East Gillibrands, Skelmersdale WN8 92A, England.* Reader Service number 482.

DIRECTION-FINDING EQUIPMENT FROM DOPPLER

Doppler Systems' latest line of radio-direction-finding units operates with any narrow-band FM receiver in the 27–500-MHz range to provide fast location of interfering signals. No receiver modifications are required—the direction finder connects to the receiver's antenna and external-speaker jacks.

Four economical models are available which provide a range of optional display and remote-output features: a 16-LED compass rose, a 3-digit bearing in degrees, an RS-232C output, and a synthesized voice output. The speech synthesizer is designed for mobile use, as it eliminates the need for the driver to watch the display.

The system operates by continuously summing the outputs of four antennas, simulating the motion of a single rotating antenna. As the simulated antenna moves toward the rf source, an increase in the apparent signal frequency occurs, and as the antenna moves away from the source, this frequency decreases. The up/down (Doppler) frequency shift is detected by the FM receiver and is present as a 300-Hz tone on the audio output. The phase of the tone is measured and used to compute the bearing without affecting the normal operation of the receiver.

For more information, contact *Doppler Systems, 5540 E. Charter Oak, Scottsdale AZ 85254; (602)-998-1151.* Reader Service number 477.

HEATHKIT RTTY TUNING AID

The new HD-3006 Crossfire Tuning indicator is a visual tuning indicator for radioteletype (RTTY) communication. Sixteen LEDs make up the display: Eight vertical LEDs identify mark signal strength while eight horizontal LEDs do the same for space signal strength. Tuning the indicator for maximum vertical and horizontal display will provide a strong signal for computers or RTTY printers. Each LED bar requires approximately 14 dB no-signal-to-signal voltage ratio for full operation. Minimum input signal is 0.3 V ac rms or 0.5 V dc. Maximum signal is 15 V ac rms or 15 V dc.

The HD-3006 has a wide voltage range and is compatible with almost any interface/terminal unit that has oscilloscope outputs for tuning. The ac/dc cube-type power supply is included in the kit.

To receive a copy of Heathkit's free catalog, write *Heath Company, Dept. 150-435, Benton Harbor MI 49022.* Reader Service number 483.

EASYTALK BY NADY

Nady Systems' EasyTalk™ personal radio communicators are ideal for outdoor activities when close contact with a partner or group is desirable. EasyTalk communicators are lightweight, rugged, and easy to operate. The units are voice-triggered so the user's hands are free. Range is up to ½ mile in optimum conditions.

EasyTalk, from Nady Systems.

EasyTalk operates in the 49-MHz FM band. No license is required for use. Model PRC-1X is a clip-on bodypack transceiver with attached headset. The PRC-1X works in the simplex mode—any number of units on the same channel can be used in an area, with users speaking one at a time. Transmission is voice-activated (VOX) or push-to-talk (PTT), with a PTT button on the bodypack. An optional remote-PTT button on a one-meter cable is available.

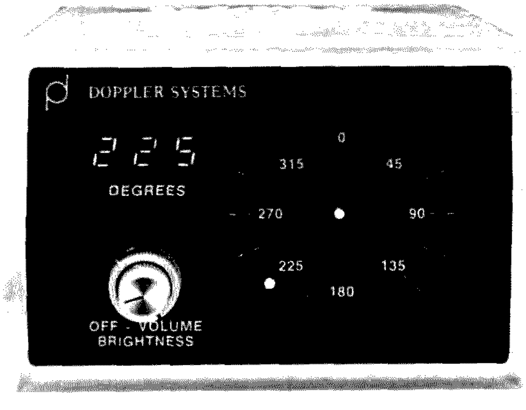
Model PRC-3X features full-duplex operation—two users can converse simultaneously, as they would on a telephone. The unit is also a clip-on bodypack with headset.

Nady EasyTalk communicators incorporate the latest advances in integrated-circuit technology. The receiver is a highly sensitive dual-conversion superheterodyne for clean, noise-free reception. Headphone volume is adjustable, and the microphone is a unidirectional, noise-cancelling type allowing voice-triggered use in high-noise environments. The microphone is mounted on a flexible boom which holds its position for individual users. Additional features include a call feature to save batteries and a flashing LED indicator to warn of low battery level.

For more information, contact *Nady Systems, Inc., 1145 65th Street, Oakland CA 94608; (415) 652-7632.* Reader Service number 481.

AMTOR-10A FROM HAL

Hal's new AMTOR-10A allows transmission and reception of radio-teleprinter sig-



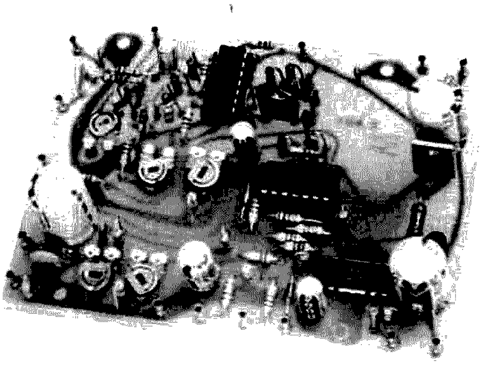
Doppler Systems' DF unit.

The Hal AMTOR-10A.

nals with the added feature of error correction. The ITU 7-unit code is used for error correction as defined by CCIR Recommendation 476-2. The AMTOR-10A is a code- and speed-converter unit that, when used with the CWR6850, allows 7-unit AMTOR code communications at 100 baud while retaining communications capability with the standard 5-unit Baudot code from 20 to 100 baud, and the 8-unit ASCII code from 75 to 200 baud. The AMTOR-10A is designed to easily interface with the CWR6850 while retaining all of the standard features of the unit, including CW capability. Modes and functions are selected from the keyboard of the CWR6850.

For additional details, write or call *Hal Communications Corp., PO Box 365, Urbana IL 61801; (217)-367-7373.* Reader Service number 479.

HAMTRONICS COR-3



The COR-3 from Hamtronics.

Hamtronics®, Inc., has announced the availability of a new version of their popular COR module, called the COR-3. Like the COR-2 module, the new COR-3 has all the circuitry needed to control a transmitter and receiver to make a repeater: an electronic relay to switch the transmitter on and off as a function of the receiver squelch, a tail timer, a time-out timer, an audio mixer, and a local-speaker amplifier. The COR-3 also has an added courtesy-beep function, including an additional timer which allows the beep delay to be adjusted to up to five seconds after the receiver squelch drops.

Whenever a station using the repeater releases his microphone, a beep tone is heard on the repeater after a short delay period. The beep indicates that the party has finished talking and the time-out timer is reset. The adjustable delay, which is in addition to the normal carrier tail, eliminates talk-over by encouraging users to wait for breakers before picking up the conversation.

For more information on this module and other transmitter, receiver, and control modules for building repeaters, or for a free copy of Hamtronics' new catalog, write to *Hamtronics, Inc., 65F Moul Road, Hilton NY 14468-9353; (716)-392-9430.* Reader Service number 478.

HANDY REFERENCE CARD FROM MICRO LOGIC

If you design or repair electronic circuits, you can now get a handy plastic reference card that lets you get right to the basic workings of everything from op amps to programmable unijunction transistors without having to go through theory, fabrication methods, or advanced terminology. From Micro Logic Corp. of Hackensack NJ, Micro-Chart #10, entitled "Active Electronic Components," is a two-sided 8-½"-by-11" plastic card that is packed with information.

Non-digital functions readily available in a single monolithic package are covered, including 13 diode types, 6 types of transistors, 5 families of thyristors, 4 types of light emitters, 9 types of light receivers, analog switches, A/D and D/A converters, comparators, multipliers, one-shots, op amps, opto-couplers, PLLs, bridge rectifiers, sample-and-hold circuits, Schmitt triggers, tone decoders, varistors, vcos, voltage followers, voltage regulators, and more. Typical descriptions cover: name of part, signal names, detailed operation, and examples of key specification parameters.

For more information, contact *Micro Logic, Dept. P, PO Box 174, Hackensack NJ 07602; (201)-342-6518.*

REVIEW

IC-37A

Those of you not active on 220 MHz over the past several years could not possibly understand. A new base/mobile rig for 1¼ meters can provoke the same excitement as working XZ on five bands. After all, there hasn't been a credible entry in the 220 base/mobile market since the Midland 13-509 and 13-513, some five years back.

All that has changed now with the introduction of the ICOM 37A. For those who don't already know about it, this rig is part of the series which includes the IC-27A and 27H, and the soon-to-be-released IC-47A. If you haven't seen one of these rigs yet, you have a surprise coming. The 37, like its brothers, is *tiny*. Also, like its brothers, it has a very hot receiver, some very nice features, and a few drawbacks. But I'm getting ahead of myself a bit.

You should know that the rig I got was a demo at Dayton, which should give you some idea of its condition. While certainly undamaged, it had been well pawed over—so I knew it would be an excellent specimen for review. Also, because of this, I got my review unit in an ICOM bag, without either a manual or a box. ICOM did send the manual later. But without the book, I had to learn how to operate the rig on my own, which was difficult. I finally found another IC-37 owner who gave me the information I needed to learn the ropes on the rig. He and several other IC-37 owners also gave me several comments which are included in this review. Don AF9M graciously supplied the use of his two-way-radio shop for the measurements used in this review. Both his 37 and mine were measured.

The very first thing I learned about this rig was its absolutely beautiful transmit audio quality. I was told, right off, that this rig runs rings around anything on the air, and having heard several 37s by now, I have to agree. However, when you get your rig, be prepared to drop by the local two-way shop or local repeater techie and have your deviation checked. Both my rig and AF9M's had the modulation cranked up too high. Both the mike gain and deviation potentiometer could stand minor adjustment. Also, have you PL™ deviation checked—it may be too low. The sine wave coming out of the PL generator is so pure that, without any harmonics of any kind, the typical PL detector will be somewhat at a loss as to what to do with it. Really! As supplied, the PL deviation is set for 500 Hz. 750 Hz will do the job much better.

The receive audio is not quite as pretty, but let's be fair about this. The rig is tiny (remember?) and there is simply no room in there for a luxury speaker. In a home listening environment, the internal speaker is very adequate. In the relatively high ambient noise level of an automobile, a better speaker is a *must*. Enough said.

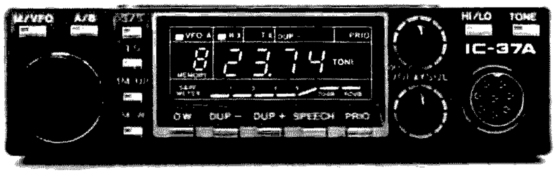
Receive sensitivity is no problem, and no additional preamp is needed. It specs out at .20 μV/m for 12 dB Sinad. Be careful when making Sinad measurements. Although nobody else had this problem, the audio stage of my rig went into oscillation and died when we hooked the leads across the speaker. No, we didn't short anything out. My rig just didn't like test leads, that's all.

One other aspect of receiver performance worth noting is the ability to handle high-rf environments, such as in downtown urban areas. The IC-37 seems to hold its own in downtown Chicago, though we're trying more testing.

Back on the transmit side there is more good news. This rig is clean, clean, clean. All of the IC-37s which were tested checked out at 80 dB down for spurs and 75 dB down for harmonics. White noise (checked on my rig only) was down 65 dB from the carrier output 50 kHz either side of the carrier. Yes, the rig could almost be used in repeater service.

I said, "almost." I found only two complaints from users about the IC-37, and the big one is *heat*. The case gets beastly hot during transmit, sometimes too hot to touch. Now I know that there have been no failures in any IC-37A to date which could be traced to heat, so I know that ICOM seems to have done their homework in the thermal-design department. But I'm from the school which says, "too hot to touch is too hot," and this still scares me a lot. Two thoughts on this: First, both high *and* low power are adjustable. Yes, the rig is rated at 25 honest Watts and yes, it will honestly put out those Watts. But if you're a bit squeamish about heat like I am, you may want to back down the high-power output to, say, 18 or 20 Watts and get yourself some insurance against heat failure. Second, it is mandatory to make sure that: a) the rig is well ventilated, and b) the cover is buttoned-down tight on the rig if you're going to transmit with it. ICOM has designed the 37's mechanical structure so that the entire case is a heat sink, and it needs all of it.

While we're still in the gripe department, there is a problem with the offset system in the IC-37A. The rig, as supplied, is programmed for an automatic −1.6-MHz offset in the repeat mode, unless you change it. So far, so good. However, if you wish to change to another offset, you can only program offbeat offsets in 100-kHz increments. The fact that you can't do it in 10-kHz increments is a real



The IC-37A 220-MHz transceiver from ICOM.

WHAT DO YOU THINK?

Have you recently purchased a new product that has been reviewed in *73*? If you have, write and tell us what *you* think about it. *73* will publish your comments so you can share them with other hams, as part of our continuing effort to bring you the best in new product information and reviews. Send your thoughts to Review Editor, *73: Amateur Radio's Technical Journal*, Peterborough NH 03458.

problem, and I would strongly suggest that ICOM change the software in their controller to allow 10-kHz-offset adjustment increments. That's it on the complaints.

The instruction manual is the typical well-done ICOM book. What more can I say? The schematic is clean and well laid-out. All rig adjustments are well documented, and the text is very straightforward.

There is, at this time, one option available with the rig, a speech synthesizer. When this option is in place and the speech button is pushed, the frequency on the display (receive or transmit) is spoken through the speaker by a synthesized female voice. I am not sure I would take this option, although it may be useful in the car when I have to watch the road and not the rig. However, for the sightless ham, this is the only way to go. The $30 price is more than worth it.

The PL generator (standard) is right on the money, frequency-wise, though as mentioned earlier, it is a little on the low side, deviation-wise. In the memory modes, the correct PL is automatically keyed in on those frequencies where you need it. However, it only works in the duplex mode, not on simplex.

Other nice features include up/down switches on the mike to help prevent auto accidents when you're tuning the rig, two vfos, and three modes of scanning: memory, band segment, or the entire band. I find the scanning rate a little slow in the memory mode and would suggest that the fast/slow scan switch (a DIP switch inside the rig) be left on fast at all times. Other nice touches: fuses on *both* the positive and the negative supply leads. If something goes wrong in your car's electrical system, you'll thank ICOM for their forethought. The mobile mount is well designed, rugged, and functional. And finally, there is provision for an outboard battery for the memory in the power plug.

A lot more could be written about this rig, and probably will be in the months to come. It would suffice to say, however, that with everything taken into account, the IC-37A was well worth waiting for. It may not be too farfetched to suggest that this may be the next standard rig for 220 FM. The IC-37A is priced at about $450 (without synthesizer option).

For further information, contact *ICOM America, Inc., 2112-116th Ave. NE, Bellevue WA 98004; (206)-454-8155.* Reader Service number 484.

Art Reis K9XI
New Lenox IL

IC-37A

	Spec	Measured
Power requirements	13.8 volts	
high power	6.5 Amps	6.2 Amps
low power	3.0 Amps	2.4 Amps
receive	0.5 Amps	
Rf output	25 Watts	23.5-25.5 Watts (adjustable)
Rf output/input impedance	50 Ohms	
Receiver sensitivity	0.2 μV/m, 12 dB Sinad	0.2 μV/m, 12 dB Sinad
Maximum frequency deviation	± 5 kHz	± 6 kHz
Spurious emissions	60 dB below carrier	65 dB, white noise 75 dB, harmonics 80 dB, others

NCG 7-21-50

If you didn't know to begin with, you probably wouldn't be able to tell that this little transceiver is a QRP rig. On-the-air reports are very satisfying, with praise for good audio and clean CW keying. The receiver compares very favorably with others I've used, particularly with respect to recovered audio. It's crystal clear and plenty loud when you want it to be.

What I'm talking about is NCG's newest import from Japan—a neat, small, three-band quality package that sells for $445. The 7-21-50 seems to fill a gap between the full-house transceivers that cost an arm and a leg and those which offer only CW or a single band.

If you're wondering about coverage, you get 300 kHz on 40 meters, 450 kHz on 15 meters, and 500 kHz on 6 meters! That's right—*six meters.* As you may have guessed, these three bands are permitted in Japan for the Class-B (ten-Watt) group of operators who build their skills (considerable, at that) while using low power. Don't sneeze at ten Watts, however, because it's enough for worldwide communications under favorable band conditions. In a little over an hour of part-time operating, I've been able to work Arizona on 15-meter phone, New Mexico on 15 CW, Kansas on 40 CW, and Virginia, South Carolina, and Tennessee on 40 phone. Nope, I haven't worked any six-meter stations yet, but I haven't heard any either—in spite of considerable listening. Peterborough, New Hampshire is not exactly the hub of VHF activity these days, and we're just far enough from Boston (with lots of hills in between) to be unable to pick up their local 6-meter activity. During the time I have been listening on six, there hasn't been any sporadic-E propagation, either. There's no doubt in my mind that the results on six will be as favorable as those on the other two bands as soon as things "hotten up" a bit.

Circuit Features

The local-oscillator section uses a phase-locked-loop system in which the vfo output is used as one input for the phase comparator and a mixed-down vco signal is used for the other input. With this arrangement, the vco output can be used as is for the local-oscillator signal. This reduces internal beat noise during reception and minimizes production of spurious signals during transmission. The phase-comparator frequency is in the 700-kHz range, which tends to reduce adverse S/N-ratio effects sometimes found with normal PLL systems. The transceiver's frequency stability is exactly the same as that of the vfo, which can be quite good through the use of temperature compensation and the fact that it is a low frequency (in the 3-MHz range) to begin with.

The NCG 7-21-50.

NCG 7-21-50

Size
9-3/4" × 4-3/8" × 11-3/4"
11 pounds
Frequency Range
40 meters—7.0-7.3 MHz
15 meters—21.0-21.45 MHz
6 meters—50.0-50.50 MHz
Mode
SSB—lower on 40-meter band, upper on 15- and 6-meter bands
CW—all bands
Stability
From one minute to sixty minutes after switch-on, within ± 1 kHz. Thereafter, within 100 Hz per thirty minutes
Power (Input/Output)
26 Watts PEP input
10 Watts PEP output
Power Supply
ac—120 V, 60 Hz
dc—13.8 V ± 10% (negative ground)
Antenna Impedance
50 Ohms, nominal unbalanced coax
Suppression
SSB—50 dB or more (1.5-kHz modulating frequency)
Carrier—40 dB or more
Spurious—40 dB or more (40 and 15 meters); 60 dB or more (6 meters)
Receiver
Single conversion superheterodyne using a 9-MHz i-f on SSB and an 8.9993-MHz i-f on CW
Sensitivity
Better than 0.25 microvolts for a 10-dB S/N
Selectivity
SSB: − 6 dB ± 1.1 kHz, − 60 dB ± 3 kHz maximum
CW: − 6 dB ± 200 Hz, − 60 dB ± 3 kHz maximum
Image Ratio
Greater than 60 dB
I-f Rejection
60 dB or greater
Other Spurious
70 dB or greater
Delta F (Incremental Tuning) Range
± 1.5 kHz
Audio Output Power
Internal speaker—0.5 W at 10% distortion at 8 Ohms nominal
External speaker—1.5 W at 10% distortion at 8 Ohms nominal

In the receiver section, switching between lower sideband and upper sideband is automatically accomplished when the bandswitch is changed, ensuring that the proper sideband is always in use no matter which band is in use. A 9-MHz monolithic filter removes unwanted nearby signals from the i-f frequency, which is then amplified and product detected in the usual manner by the 3-stage i-f amplifier. For SSB, the detected af signal is sent to the audio amplifier, but for CW, it first passes through an op-amp active filter for improved selectivity.

The noise blanker employs an IC to amplify mixer output noise, which is then rectified and dc amplified before being applied to the i-f on/off gating circuit.

The transmitter uses the filter-type SSB generation scheme, with an i-f frequency of 9 MHz, in a single-conversion circuit. Voice signals are amplified by low-noise transistors and presented to a balanced-modulator IC, which produces a DSB signal without a carrier. The DSB signal passes through a monolithic filter which removes the carrier, resulting in the desired SSB signal. The desired SSB signal is amplified by i-f amplifier and then frequency converted by a double-balanced mixer to the desired output frequency. An LC bandpass filter removes spurious signals from the mixer's rf output signal, which is then amplified to the 10-W output level by a 7-50-MHz wideband amplifier. The wideband amplifier features a push-pull configuration in all three stages (preamplification, driver, and final amplifier), reducing distortion and canceling even harmonics. The amplified 10-W signal then passes through low-pass filters for each band to remove harmonic components, and is then presented to the rf output connector. A portion of the drive power is rectified in a negative-feedback circuit and presented to the input gate of the FET i-f amplifier, reducing its gain and causing the ALC indicator's LED to light.

It is recommended that the antenna vswr not exceed 1.5:1 without the use of an antenna tuner. It is also suggested that continuous CW output be limited to no more than 3 minutes. For RTTY or SSTV use, the microphone gain control should be turned down to reduce the rf output to about 50% or less of the rated output (to avoid excessive heat and damage to the final solid-state power amplifiers). The operator is cautioned never to change the bandswitch while transmitting or operate the transmitter without an antenna connected to the output terminal—otherwise the power-amplifier transistor will be damaged.

Conclusion

The first (very slight) reservation I have about this neat little rig is the fact that only the "normal" sideband is provided for each band, which effectively prevents one from receiving or transmitting on the "opposite" sideband. This is something that I rarely do, anyway, so the loss is negligible with regard to my operating habits. The other reservation I have is about the ultra-fast tuning. By that I mean the large

frequency excursion with each rotation of the tuning dial. Fortunately, the dial is fairly firm, and a careful touch can be developed to tune in a station without too much trouble. Also, the built-in fine-tuning arrangement, using the "delta F" controls, simplifies matters greatly. If you tend to be a frequency hopper, you will like the fast tuning which permits you to jump from low to high end of any band in a few quick turns of the knob.

Otherwise, I can't really fault any aspect of this little rig. . .not even the 10-Watt output. It would be very easy to provide a nice solid-state external linear amplifier that could give the output of a more usual station transceiver. For the low price you pay compared to other rigs, you won't be getting all of the bells and whistles, but you will be getting a really good CW filter, good audio reports, and a go-anywhere transceiver suitable for portable/mobile QRP operation on either 12 volts dc or 110 volts ac. You don't have to buy any kind of external power supply and you don't have to buy a microphone. You will need only a key of your favorite type and an antenna. Portability, simplicity, digital frequency readout, light weight, small size, a built-in speaker, and many other things you'll like are standard equipment with the NCG 7-21-50. Of course, you didn't expect big-rig performance, and I won't kid you into thinking that you'll get it every time. . .but you will be happily surprised at the reports you do get, and even happier with the price.

For complete details, contact *NCG, PO Box 2331, Anaheim CA 92804.* Reader Service number 487.

Jim Gray W1XU
73 Staff

BELDEN 9913 COAX

Ordinarily, the introduction of a new type of coaxial cable would not merit a write-up in an amateur-radio journal. However, Belden's new type 9913 RG-8/U cable is such a radical departure from previous RG-8/U-type cables that it does indeed merit such attention—not only from its intended market, the new 800-MHz cellular-radio service, but from amateur VHF/UHF enthusiasts as well.

What makes 9913 different from other conventional RG-8/U coaxial cables is its construction: Belden uses a single, solid #10 copper wire for the center conductor, then encases it in a polyfoam-type dielectric. The difference is that only a small, spiral-shaped portion of the dielectric actually rests against the center conductor. The balance of the dielectric immediately surrounding the center conductor is—you guessed it—air. And air makes an excellent dielectric at VHF/UHF frequencies, which would indicate good low-loss performance from 50 MHz through 1000 MHz.

The shield is clever, too: A thin film of solid aluminum foil is durabonded to the dielectric to provide 100% shield coverage. Wound around this is about 60%-coverage tinned wire to facilitate solder connections. The final cover is the black UV-resistant poly jacket. All this in a cable that has the same outside dimensions as conventional RG-8/U cables! The best description of 9913 would be a cross between hardline and CATV-type RG-59/U coaxial cable.

As might be expected, 9913 is not a truly flexible line. It could best be described as semi-rigid coaxial cable, as opposed to rigid-aluminum or corrugated-jacket cable. Yet, the minimum bend radius is specified at 8 inches. Try that with a piece of 1/2" hardline sometime! 9913 will fit all standard coax fittings for RG-8/U cables, such as UHF and N connectors (requiring some modifications on the latter).

Tests were performed by the members of SCORE (Society of Contest Operators and Radio Experimenters) to determine the actual loss an average amateur might see in normal use. Tests were made using nothing more than high-power rf sources on each band and two Bird Model 43 wattmeters at each end. Additionally, a Bird Termaline coaxial resistor was connected at the end to present a constant 50-Ohm impedance to the source through 1 GHz. We swept an entire 1000-foot put-up on every band except 1296 MHz, where the unavailability of high-power equipment resulted in our testing only a 100-foot piece of cable. All tests were done using type-N connectors throughout.

Results are shown in Fig. 1, and they are very good indeed. 9913 holds its own against most conventional transmission lines through about 30 MHz (including Belden's other non-standard RG-8/U, type 8214), but there is a dramatic difference above this frequency. Consider that most conventional RG-8/U cables have over 2.5 dB loss at 144 MHz, while 9913 comes in almost 1 full dB lower. Not only that, a figure of 2.7 dB per 100 feet at 432 MHz for a soft transmission line such as RG-8/U is outstanding. Most other cables will exhibit a loss anywhere from 3.5-5 dB at this frequency!

Clearly, this cable was designed with the 800-MHz cellular user in mind. The lucky hams who have been able to obtain lengths of 9913 (the factory has it constantly back-ordered) have put it to a myriad of uses. Several are even using it as feedlines for antennas at up to 1296 MHz. Two amateurs in Florida are claiming a QRP DX record on 1296 MHz using 350 microwatts through about 100 feet of 9913 to loop yagis. The distance worked was over 320 miles! Some simple math will tell you that only about half the power made it to the antenna—a pretty impressive record, in any event. Try that with conventional RG-8 and the loss will be about 8-10 dB per 100 feet.

Here at KT2B I use 9913 for 65-foot-long transmission lines at 144 MHz and for pigtails on 432 and 1296 from 1/2" hardline. The loss at 144 MHz compares favorably with 1/2" hardline and the loss at 1296 is only about 2 dB worse than Prodelin 1/2" Spir-O-Line cable, which uses a similar spiral dielectric. 9913 works exceptionally well at HF as a high-power coaxial line. The large center conductor can handle many Amps of rf current and the dielectric will not break down as easily as regular RG-8/U. Our group, SCORE, is currently testing 9913 for use as coaxial-balun material on 20- and 15-meter beams.

Now—about using coaxial connectors. If you prefer PL-259/UHF-type connectors, you will find the installation the same as with regular RG-8/U cable. The #10 center conductor makes a snug fit into the center pin. The braid, however, is somewhat tricky to secure. I suggest tinning the braid lightly with a soldering iron of no more than 40 Watts rating. Do not use a 100/150-Watt gun, as you run a risk of melting or distorting the dielectric! This will ruin the performance of the cable and likely cause a severe impedance bump at the joint. If you lightly tin the braid, then it will be easy to solder through the solder holes on the plug and finish the connection. Again, use a low-wattage iron. Don't try to remove the aluminum foil from the center dielectric when you pull the braid back either. At 50 MHz, 144 MHz, and 220 MHz, it is a very good idea to use PL-259s with a Teflon™ dielectric. Amphenol makes these and several radio distributors sell them for about $2.00 each.

Type-N connectors are another story. Since this is a relatively new cable, it'll take some time before the major connector manufacturers come out with a 50-Ohm type-N plug that will accommodate the #10 center conductor. Until then, you'll have to do as I did and file down the center pin until it is about #12 in diameter. It is frustrating, but the results are worth it. Additionally, you should try to use connectors that employ both a front-washer contact (between the braid and shell) and a back washer (between the rear nut and rear rubber gasket). Otherwise, you are likely to pull the connector off the first time you twist it! 9913 depends on its foil for shielding and the braid is not substantial, so a friction fit with conventional type-N connectors may be undependable. Kings Mfg. Co. makes a line of type-N connectors that employ both back and front washers and I recommend these highly. Failing that, you can use regular type-N connectors if you install a front washer yourself. Without it, you'll have a loose connection!

In summary, Belden 9913 makes an excellent all-purpose flexible line with some of the characteristics of hardline. It is an outstanding performer at VHF and UHF, and is the answer for those using crank-up towers with VHF/UHF arrays on them. 9913 is available through dealers for about 43¢-48¢ per foot, in 100-foot lengths.

For more information, write *Belden Corp., Elec. Div., Dept. G, PO Box 1980, Richmond IN 47374.* Reader Service number 486.

Peter Putman KT2B
Morris Plains NJ

Frequency in MHz	Loss in dB/100 ft
28.0	0.8
50.0	1.0
144.0	1.6
220.0	2.0
432.0	2.7
1296.0	5.2

Fig. 1. Loss figures for Belden 9913 coaxial cable, as determined experimentally.

SATELLITES

USING THE AO-10 APOGEE PREDICTIONS

Apogee predictions for the month of December are provided for three sections of the United States: Washington DC at 39N 77W, Kansas at 39N 95W, and California at 38N 122W. Times are in UTC and apogee in this case is mean anomaly 128 rounded to the nearest whole hour. Use the chart as a guide in aiming your antenna, then fine-tune the azimuth and elevation values to peak the satellite's beacon signal. If you require more accurate orbital predictions, contact AMSAT at PO Box 27, Washington DC 20044.

AMSAT-OSCAR 10 APOGEE PREDICTIONS
DECEMBER 1984

ORBIT	DAY	TIME	WASH AZ	WASH EL	KANSAS AZ	KANSAS EL	CALIF AZ	CALIF EL
1434	1	0200	263	20	249	34	218	54
1436	2	0100	256	30	240	44	197	60
1438	3	0000	247	40	226	53	171	62
1440	4	0000	240	42	215	53	160	58
1442	4	2300	227	50	195	59	139	54
1444	5	2200	209	58	170	60	122	47
1446	6	2200	197	57	160	56	119	41
1448	7	2100	173	59	139	52	108	33
1450	8	2000	149	57	123	46	98	24
1452	9	2000	143	51	120	40	97	18
1454	10	1900	126	45	108	32	89	10
1456	11	1800	113	38	99	23	81	1
1458	12	1800	111	32	97	17		
1459	13	0500					273	8
1460	13	1700	101	23	89	9		
1461	14	0400					267	18
1462	14	1600	92	15	81	1		
1463	15	0400					262	20
1464	15	1500	85	6				
1465	16	0300			272	8	254	31
1466	16	1500	83	1				
1467	17	0200	277	4	266	18	246	40
1469	18	0200	272	6	260	21	238	42
1471	19	0100	266	16	253	31	224	51
1473	20	0000	259	26	243	40	206	58
1475	21	0000	252	28	235	42	194	57
1477	21	2300	243	38	222	50	170	58
1479	22	2200	232	47	203	57	147	56
1481	23	2100	216	55	179	60	128	50
1483	24	2100	205	55	169	57	124	44
1485	25	2000	182	58	146	54	112	36
1487	26	1900	158	58	129	48	102	27
1489	27	1900	150	53	125	42	100	21
1491	28	1800	132	48	112	35	92	13
1493	29	1700	118	41	102	26	84	4
1495	30	1700	115	35	101	20	83	0
1497	31	1600	107	30	96	18		

SPECIAL EVENTS

Listings in this column are provided free of charge on a space-available basis. The following information should be included in every announcement: sponsor, event, date, time, place, city, state, admission charge (if any), features, talk-in frequencies, and the name of whom to contact for further information. Announcements must be received by 73 Magazine by the first of the month, two months prior to the month in which the event takes place. Mail to Editorial Offices, 73 Magazine, Pine St., Peterborough NH 03458.

BULLHEAD CITY AZ
NOV-DEC

Bullhead City, Arizona and the Western Arizona Radio Club will join forces to celebrate an historic occasion. Bullhead City, a well established community on the Colorado River, became incorporated in late August and is now the newest city in the state of Arizona. In honor of this occasion, during the months of November and December, any station working a member of the Western Arizona Radio Club will be offered an attractive certificate. All amateur bands will be operated, including 2 meters. A QSL and an SASE (6.5" × 9") will be required (include two extra 20-cent stamps for a bonus information package). Address your request to WARC, PO Box 416, Bullhead City AZ 86430.

FARIBAULT MN
DEC 1

The annual Handi-Ham Winter Hamfest will be held on Saturday, December 1, 1984, at the Eagles Club in Faribault MN. Registration will begin at 9:00 am. There will be a Handi-Ham equipment auction, a program, and dinner at noon. Talk-in on .19/.79. For more information, contact Don Franz WØFIT, 1114 Frank Avenue, Albert Lea MN 56007.

SANTA CLAUS IN
DEC 1-2

The Pike County Amateur Radio Club of Winslow IN will operate station W9CZH beginning at 1700Z, December 1, 1984, until 1700Z, December 2, 1984. The approximate frequencies will be 3.925, 7.265, 14.265, and 21.395 phone, 7.133 CW, and 146.52 FM. A special QSL/Xmas card postmarked from the Santa Claus Post Office will be sent upon receipt of an SASE to W9CZH, RR 1, Box 311, Winslow IN 47598.

EVERGLADES NATIONAL PARK
DEC 1-2

The Everglades ARC will operate special-event station W4SVI on December 1 and 2, 1984, to commemorate the 37th anniversary of the dedication of the Everglades National Park. W4SVI will operate from Flamingo on the southern tip of Florida between 1300Z and 2300Z both days. Frequencies: lower edge of the 10-to-40-meter General phone bands as well as 146.52 FM. Certificate for large SASE to Everglades ARC, 14511 SW 287 Street, Leisure City FL 33033. Enclose your QSL card for display at the Miami Hamboree in February.

BETHLEHEM PA
DEC 21-23

The Delaware-Lehigh Amateur Radio Club (W3OK) in conjunction with the Christmas City, Bethlehem PA, will operate December 21-23, 1984, from 1500Z to 0200Z, on frequencies 3990 kHz, 7299 kHz, 14.225 kHz, 21.325 kHz, and 28.525 kHz. For a certificate of contact, send a large SASE to DLARC W3OK, Greystone Building, Gracedale, Nazareth PA 18064.

SOUTH BEND IN
JAN 6

A hamfest swap and shop will be held on Sunday, January 6, 1985, at the Century Center, downtown on US 33 Oneway North between the St. Joseph Bank Building and the river, South Bend IN. Open tables are $1.00 per foot in a carpeted half-acre room. The Industrial History Museum is in the same building. Four-lane highways lead to the site from all directions. Talk-in on .52/.52, .99/.39, .93/.33, .78/.18, .69/.09, and 145.29. For more information, contact Wayne Werts K9IXU, 1889 Riverside Drive, South Bend IN 46616, or phone (219)-233-3507.

WEST ALLIS WI
JAN 12

The West Allis Radio Amateur Club will sponsor the "Original" Annual Midwinter Swapfest on Saturday, January 12, 1985, beginning at 8:00 am, at the Waukesha County Expo Center Forum (take I-94 to Co. F, south to FT, west to Expo). Admission is $2.00 in advance and $3.00 at the door. Four-foot tables are $3.00 in advance (December 31st deadline) and $4.00 at the door. Food will be available. For

tickets, send an SASE to WARAC Swapfest, PO Box 1072, Milwaukee WI 53201.

RICHMOND VA
JAN 13

The Richmond Amateur Telecommunications Society will sponsor the eighth annual Richmond Frostfest on Sunday, January 13, 1985, from 8:30 am to 3:30 pm, at the Virginia State Fairgrounds. General admission is $4.00. Flea-market spaces are $3.00 without a table and $7.00 with an 8-foot table. Booths with side curtains and backdrops are available to dealers and exhibitors and the building will be open Saturday afternoon for setup (there will be armed security at all times). The entire show will be indoors with no outside tailgating. The deadline for booths is December 30, 1984, and for the flea market January 10, 1985. For more information, write Richmond Frostfest, PO Box 1070, Richmond VA 23208, or call Bill Scruggs N4DDM at (804)-272-8206.

SOUTHFIELD MI
JAN 20

The Southfield High School Amateur Radio Club will sponsor its 20th annual Swap and Shop on January 20, 1985, from 8:00 am to 3:00 pm, at Southfield High School, 24675 Lahser, Southfield MI. Admission is $2.50. Two 8-foot reserved tables are $20.00 and each addtional reserved table is $10.00 (paid in advance). Tables will be available at the door. Doors will open at 6:00 am for exhibitors. There will be plenty of parking and food. All profits go toward electronics scholarships and to support the activities of the Southfield High School Amateur Radio Club. For more information, advance tickets, and/or reservations, write Mr. Robert Younker, Southfield High School, 24675 Lahser, Southfield MI 48034. Indicate with your reservation whether you will need wall space and/or electrical outlets. All table reservations will be confirmed.

YONKERS NY
JAN 27

The Yonkers Amateur Radio Club will sponsor the Yonkers Electronics Auction on Sunday, January 27, 1985, from 9:00 am to 3:00 pm, at Lemko Hall, 556 Yonkers Avenue, Yonkers NY. Admission for buyers and sellers is $3.00 each; children under 8 will be admitted free. New and used equipment will be auctioned and can be inspected from 9:00 am to 10:00 am. There will be plenty of seats and parking and the auction will start at 10:00 am sharp. Unlimited free coffee will be available all day. The club will charge a 10% commission on the first $100 and 5% on the remainder on successful sales only. Talk-in on 146.265T/146.865R, 440.150T/445.150R, and .52 direct. For more information, write YARC, 53 Hayward Street, Yonkers NY 10704, or phone (914)-969-1053.

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MATERIALS

Send to Advertising Department, *73*, Elm Street, Peterborough NH 03458.

MOBILE IGNITION SHIELDING. Free literature. Estes Engineering, 930 Marine Drive, Port Angeles WA 98362. BNB006

WANTED: Cash paid for used speed radar equipment. Write or call: Brian R. Esterman, PO Box 8141, Northfield IL 60093; (312)-251-8901. BNB030

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REPAIR, alignment, calibration. Collins written estimates, $25; non-Collins, $50. K1MAN, (207)-495-2215. BNB117

IMRA—International Mission Radio Association helps missionaries by supplying equipment and running a net for them daily except Sunday, 14.280 MHz, 1900-2000 GMT. Br. Bernard Frey, 1 Pryer Manor Rd., Larchmont NY 10538. BNB123

ELECTRON TUBES: Receiving, transmitting, microwave . . . all types available. Large stock. Next-day delivery in most cases. Daily Electronics, 14126 Willow Lane, Westminster CA 92683; (714)-894-1368. BNB150

NEW HAM-SWL SOCIETY for unity of thought & learning. Open to all. Many topics, awards, free ad space in periodical, society net, museum participation. Shack pics & QSLs welcome. Writers needed. SASE for info to RCSW, 32 Applegate, Bennington VT 05201. BNB197

CHESS PLAYERS—Radio-chess schedules, matches, tournaments. Details. K2VJ, Box 682, Cologne NJ 08213. BNB207

COMMODORE 64 OWNERS: Now a custom CW cartridge with your name and call. Send and receive up to 30 wpm with split-screen display. Complete with instructions and schematics for home-brew interface only $39.95. Custom CW 2.0 from ALC Electronics, 718 W. Coral Ave., Ridgecrest CA 93555; (619)-375-7203. BNB208

CX7 REPAIRS. Mark Mandelkern, 2315 Derby St., Berkeley CA 94705; (415)-549-9210. BNB213

SCHEMATICS: Radio receivers 1920s/60s. Send name, brand, model no., SASE. Scaramella, PO Box 1, Woonsocket RI 02895-0001. BNB214

HAM RADIO REPAIR, tube through solid state. Robert Hall Electronics, PO Box 8363, San Francisco CA 94128; (408)-729-8200. BNB219

HAM TRADER YELLOW SHEETS, in our 23rd year. Buy, swap, sell ham-radio gear. Published twice a month. Ads quickly circulate—no long wait for results. SASE for sample copy. $9 for one year (24 issues). POB 356, Wheaton IL 60189. BNB220

DX HEADING MAPS for Boston, NYC, Phila., Baltimore, Detroit, Atlanta, Chicago, New Orleans, Saint Louis, Dallas, LA. 11 × 17 $1.75 pp. 22 × 34 $5.95 pp. Specify city. Bill Massey W2HOJ, PO Box 397, Hainesport NJ 08036. BNB221

KEYER/CODE-TRAINER CHIP. One-evening project. Great project for beginners, clubs, or anyone who needs a good, low-cost iambic keyer or code trainer. $15 each pp. Visa/Mastercard accepted. Micro Digital Technology, PO Box 1139, Mesa AZ 85201; (602)-897-2534. BNB224

GREAT CIRCLE BEARINGS—stop guessing. Send us your QTH or your latitude and longitude and get a personal accurate computer printout of headings and mileage from your own QTH to over 500 cities and countries throughout the US and the world, $3.95. APCA Systems, PO Box 978, Arbuckle CA 95912. BNB233

OLD ANTENNA and radio books wanted. The older the better. Clem KR6A, 26530 Parkside Drive, Hayward CA 94542; (415)-886-1205. BNB236

HERE'S OPPORTUNITY . . . security alarm business booming. Easily learned. Tremendous employment/business opportunities. For Pete's sake . . . get in now. Insider's information $2.00. Security Electronics International, PO Box 1456-JW, Grand Rapids MI 49501. BNB237

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MILITARY MANUALS. Must dispose—one dollar per pound. Radio, radar, test-equipment manuals, 1930s–1950s. Sorry, no list. Interesting, some rare material. Allow postage, book rate. Joe Cohen, 200 Woodside, Winthrop MA 02152. BNB242

TI 99/4A random code-practice programs. Dr. Code General sends international Morse code and prints on screen; you choose: speed, tone, which characters to be sent, spacing, and more! Dr. Code Speech same as General with speech; you choose how many characters before speech check. For cassette of both copyrighted programs and conditional copying privileges, send $10.00 plus $3.00 shipping and handling to N5ESF, Rt. 1, Box 1326, Lake Charles LA 70601; (318)-436-2048, no collect calls. BNB241

WANTED: Cash for your National LF-10 preselector. Harry Weber, 2605 West 82nd Place, Chicago IL 60652. BNB243

NOW AVAILABLE! The 1985 edition of *Short Wave Station Mailing Addresses*. A must for any serious ham or SWL. One of the most accurate and comprehensive directories ever compiled! Use it to get up-to-date frequency/time schedules and free international literature. Really simplifies QSLing. Makes a great gift, too! Take advantage of our half-price early-publication discount. Send just $4.00 to: The United States Association of Short Wave Listeners, PO Box 6003, Hamden CT 06517. Get your copy at this special price today! BNB244

ROHN TOWERS—Wholesale direct to users. 23% to 34% discount from dealer price. All products available. Write or call for price list. Also we are wholesale distributors for Antenna Specialists, Regency, Hy-Gain. Hill Radio, 2503 G.E. Road, PO Box 1405, Bloomington IL 61701-0887; (309)-663-2141. BNB245

GET THE FACTS! Let our rf Snitch fill you in. Attach this sensing device to your meter to detect rf power. Use for signal tracing in receivers, and tuning antennas, transmitters, oscillators and rf tank circuits. For additional information write: K8MLN or N8DPW, Engineering Research Assoc., PO Box 170, Ontario OH 44862. BNB246

PRINTED CIRCUIT DRILLS: Sizes 53, 60, 68, and 70 thru 76, $1.25 each, 10 assorted $9.95. Western Electric 500-Ohm transformers $1.50 each. Two Way Radio, 437 Payne Drive, Endicott NY 13760. BNB247

C-64 AND VIC-20 ham software: Over a dozen programs for each computer. LSASE for catalog. Specify computer. Walt KA9GLB, 4880 N. 49th St. Dept. 7, Milwaukee WI 53218. BNB248

CONTESTS

Robert Baker WB2GFE
15 Windsor Dr.
Atco NJ 08004

ARRL 160-METER CONTEST
Starts: 2200 UTC December 1
Ends: 1600 UTC December 2

The object is for amateurs worldwide to exchange QSO information with W/VE amateurs on 1.8 MHz, CW only. DX-to-DX QSOs are not permitted for contest credit. Operating categories include single-operator and multi-operator (single transmitter only). Remember that W/VE stations may transmit only in the 1800–1825- and 1830–1850-kHz segments, in conformance with the ARRL band plan. Please refrain from using the 1825–1830-kHz DX window.

EXCHANGE:

RST and ARRL section, DXCC country name, or ITU region (if maritime or aeronautical mobile).

SCORING:

Count 2 points per QSO with amateurs in an ARRL section. W/VE stations count 5 points for DX QSOs. Multiply QSO points by the total number of ARRL sections (74 max.) and DXCC countries (W/VE stations only).

ENTRIES:

Official forms and logs are recommended and are available from ARRL headquarters for an SASE or 2 IRCs. Logs must indicate time in UTC, call, and exchange. Multipliers should be clearly marked in the log the first time worked. Entries with more than 200 QSOs must include cross-check sheets. Entries must be postmarked by January 4 and sent to the ARRL, 225 Main St., Newington CT 06111.

Certificates will be awarded to the top-scoring single operator in each ARRL section and DXCC country, and to the top-scoring multi-operator station in each ARRL division and continent. Usual ARRL conditions of entry and disqualification apply.

ARRL 10-METER CONTEST
Starts: 0000 UTC December 8
Ends: 2400 UTC December 9

Contact as many stations as possible on the 28-MHz band, using no more than 36 hours of the 48-hour contest period. Listening time counts as operating time! Entry categories include: single-operator mixed-mode (phone and CW), phone only, or CW only. Multi-operator class is for single-transmitter, mixed-mode only.

No crossmode contacts are allowed. Mixed-mode single-operator and all multi-operator stations may work stations once on CW and once on SSB. One operator may not use more than one callsign from any given location during the contest period. All entrants may transmit only one signal on the air at any given time.

EXCHANGE:

W/VE stations (including KH6/KL7) send RS(T) and state or province. DX stations send RS(T) and serial number starting with 001. Maritime and aeronautical mobile stations send RS(T) and ITU region (1, 2, 3). Novice and Technician stations sign /N or /T as appropriate.

SCORING:

Count 2 points per phone QSO, 4 points per CW QSO, and 8 points for QSOs with US Novice or Technician stations. Multiply the QSO points by the total number of US states, Canadian call areas, DXCC countries (except US and Canada), and ITU regions (maritime and aeronautical mobile only).

ENTRIES:

Official logs and entry forms are recommended and are available from ARRL headquarters for an SASE or 2 IRCs. Logs must indicate time in UTC, mode, call, and exchange for each QSO. Multipliers should be clearly marked in the log the first time worked. Entries with more than 200 QSOs must include cross-check sheets. Entries must be postmarked by January 11 and sent to the ARRL, 225 Main St., Newington CT 06111.

Certificates will be awarded to: the highest-scoring single-operator station in each category from each ARRL section and DXCC country, the top multi-operator entry in each ARRL division and each continent, and additional entries as participation warrants. Usual ARRL entry conditions and disqualification rules apply.

CANADA CONTEST
Starts: 0000 UTC December 30
Ends: 2400 UTC December 30

Sponsored by the Canadian Amateur Radio Federation (CARF), the contest is open to all amateurs and everybody works everybody. Entry classes include single-operator allband, single-operator single-band, and multi-operator allband.

Use all bands from 160 to 2 meters on CW and phone combined. All contacts with amateur stations are valid. Stations may be worked twice on each band, once on CW and once on phone. No crossmode contacts and no CW contacts in the phone bands are allowed.

EXCHANGE:

Signal report, consecutive serial number starting with 001, and province.

SCORING:

Score 10 points for each contact with Canada and 4 points for contacts with other countries. VE0 counts as Canada and one multiplier. Score 20 points for each contact with any CARF official news station using the suffix TCA or VCA. Multipliers are the number of Canadian provinces/territories worked on each band, on each mode (13 provinces/territories × 2 modes for a maximum of 52 possible multipliers per band). Contacts with stations outside Canada count for points but not multipliers.

FREQUENCIES:

1810/1840, 3525/3775, 7025/7070/7155, 14025/14150, 21025/21250, 28025/28500, 50040/50110, 144090/146520. Suggest phone on the even hours (UTC), CW on the odd hours (UTC). Since this is a Canadian-sponsored contest, remember to stay within the legal frequencies for your country!

AWARDS:

A trophy will be awarded to the highest-scoring contestant in each entry class. A certificate will be awarded for the highest score in each category in each province/territory, US call area, and DX country.

ENTRIES:

A valid entry must contain log sheets, dupe sheets or statement, a cover sheet showing claimed QSO points, a list of multipliers, and a calculation of final claimed score. Cover sheets and multiplier checklists are available. Entries should be mailed within one month of the contest, with your comments, photos, etc., to: CARF, c/o N. Waltho VE6VW, General Delivery, Morinville AB, T0G 1P0, Canada.

Results will be published in *TCA*, the Canadian amateur magazine, prior to the next contest. Nonsubscribers of CARF may include an SASE for a copy of the results. The decision of the contest committee shall be final in all cases of dispute.

G-QRP-CLUB WINTER SPORTS

Daily from 0900 to 2300 UTC, December 26 to January 1. All radio amateurs interested in QRP are invited to take part in the club's activity. No special exchange information was mentioned in the information provided by the club. The operating schedule for each day is as follow:

0900–1000 UTC	= 14060
1000–1100	= 21060/28060
1100–1200	= 7030
1200–1300	= 3560
1300–1400	= 10106
1400–1500	= 3560
1500–1730	= 21060/28060
1730–2000	= 14060
2000–2100	= 7030/10106
2100–2200	= 3560
2200–2300	= 14060

Reports on the Winter Sports Activity should be sent to Fred Garratt G4HOM, 47 Tilshead Close, Druids Heath, Birmingham B14 5LT, England.

4TH ANNUAL 40-METER WORLD SSB CHAMPIONSHIP
0000Z to 2400Z January 12

SPONSORED BY:

73: Amateur Radio's Technical Journal.

MISCELLANEOUS RULES:

Work as many stations as possible on

CALENDAR

Dec 1–2	ARRL 160-Meter Contest
Dec 8–9	ARRL 10-Meter Contest
Dec 26–Jan 1	QRP Winter Sports—CW
Dec 30	CARF Canada Contest
Jan 12	73 40-Meter World SSB Championship
Jan 12–13	Hunting Lions In The Air Contest
Jan 13	73 75-Meter World SSB Championship
Jan 19–20	73 160-Meter World SSB Championship
Jan 26	73 15-Meter World SSB Championship
Jan 26–27	West Virginia QSO Party
Jan 27	73 20-Meter World SSB Championship
Feb 16–17	ARRL DX Contest—CW
Feb 23	RTTY World Championship
Feb 23–24	YL-ISSB Commo System QSO Party—Phone
Mar 2–3	ARRL DX Contest—Phone
Mar 16–17	YL-ISSB Commo System QSO Party—CW
Mar 16–17	Spring QRP CW Activity Weekend
Jun 6–9	Worldwide South America CW Contest
Jul 1	CARF Canada Day Contest
Sep 28–29	Late Summer QRP CW Activity Weekend

LONG ISLAND MOBILE AMATEUR RADIO CLUB Inc.
LIMARC LOG

NEWSLETTER OF THE MONTH

Rounding out the list of winners in 1984 is the journal of the Long Island Mobile Amateur Radio Club—the *LIMARC Log*. Editor Earl Grainger W2NXZ puts together this compendium of news and views, and does it in a consistently professional manner.

There are two areas which the *LIMARC Log* has in common with previous winners: format and content. Of course, the content is first-rate; the newsletter is full of stories and tidbits that are just plain fun to read. A recurring theme among winners seems to be the use of paid advertising. When not overdone, this can provide a steady source of income for the club and will result in a high-quality publication.

On the format side, most successful newsletters are offset-printed using an 8-1/2"-by-5" size, and look like a miniature magazine. Some use colored paper to highlight news and add excitement. The extra price is worth it—a well-presented newsletter will cause your membership roster to grow quickly!

To enter your club's newsletter in *73*'s Newsletter of the Month Contest, send it to *73*, Pine Street, Peterborough NH 03458, Attn: Newsletter of the Month.

40-meter phone during the specified times of allowable operation. The same station may be worked only once. Crossmode contacts will not count. Single-operator stations may operate a total of 16 hours. All the multi-operator stations may operate the entire 24-hour period. Off periods must be noted in your log(s) and on your summary sheet. Off periods are *no less than 30 minutes each.*

OPERATOR CLASSES:

(A) single-operator, single transmitter, phone only. (B) multi-operator, single transmitter, phone only.

EXCHANGE:

Stations within the contiguous 48 US states and Canada transmit an RS report and state, province, or territory. All other stations, including Alaska and Hawaii, transmit RS report and DX country.

POINTS:

5 QSO points for contacts with W/VE stations located within the continental 48 US states and Canada. All other contacts score 10 points each. List points for each contact on your log sheet.

MULTIPLIERS:

1 multiplier point is earned for each US state (48 maximum—a District of Columbia contact may be substituted for a Maryland multiplier), each Canadian province or territory (13 max.), and DX Country (excluding the contiguous US and Canada).

FINAL SCORES:

Total QSO points times total multiplier points equals claimed score.

CONTEST ENTRIES:

Each entry must include a contest log, a dupe sheet, a contest summary, and multiplier checklist. We recommend that contestants send for a copy of the contest forms. Enclose an SASE to the contest address listed below.

CONTEST DEADLINE:

Each entry must be postmarked no later than February 12, 1985.

DISQUALIFICATIONS:

Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each operator class in each of the contiguous 48 states, Canadian provinces and territories, and each DX country represented. A minimum of 100 OSOs must be worked to be eligible for contest awards.

CONTEST ADDRESS:

To obtain entry forms or submit an entry, forward an SASE to: 40-Meter Contest, Dennis Younker NE6I, 43261 Sixth Street East, Lancaster CA 93535.

RESULTS

1983 VK/ZL/O CONTEST

North America
Phone Transmitting
24 Hours

	Band	Total Score
K6SVL	All	27000
W3GM	All	6526
W7PQE	All	2552
K9GTQ	All	540
N4MM	All	306
WA3HUP	20	1800
VE3GCO	20	1320
W2FCR	20	576
VE3FEA	20	224
N1BRT	20	150
KW2J	20	54
K1BV	20	30
WØGOO	10	1794
AA6EE	10	24

North America
CW Transmitting

	Band	Total Score
KFIZ	All	10406
W3GM	All	8020
W8UVZ	All	5184
K4JRB	All	4648
K4PI	All	2860
K3ND	All	1886
KW2J	All	1792
AJØN	All	1548
W7PQE	All	1088
K9VKY	All	928
NE8I	All	784
KA7FEF	All	400
VE2AEJ/3	All	306
K3NTD	All	224
AA6EE	All	192
W9YCV	All	50
KA2MXO	10	144

G3ZRS, W3BE, AND K8EX RTTY WORLD CHAMPIONS

This year's World RTTY Championship was an absolute thriller. This was the third year of joint sponsorship by the *RTTY Journal* and *73*. Only 4400 points separated single-operator champion G3ZRS from second-place finisher SM6ASD. Throughout the contest there was only a couple-thousand-point margin between many of the contestants.

Peter Rodmell G3ZRS became world champion for single-operator stations while John Johnston W3BE and K. L. Miller VE7YB took the United States and Canadian championships, respectively.

On twenty meters, Dima Slyusarenko UT5RP took a commanding lead for this single-band championship. Piero Giacomelli IK5CKL became the fifteen-meter singles champ.

Mike Bottema K8EX tallied the highest contest score, becoming the world multi-operator champion. For single-band entries, multi-operator Sodermans Regemente SL5AR became the twenty-meter winner with 61,920 contest points.

Everyone apparently had a good time. The enthusiasm of the contestants spreads with each year's event. From the logs received, we've extracted some of the comments made.

RTTY CHAMPIONSHIP SOAPBOX

VE6BEV	This is my first contest. It sure was fun.
VE7ATH	This is my first RTTY contest. I enjoyed it very much. Sure hope conditions are better next time, though.
N7AKQ	Bands were good this weekend. Larger turnout, too! Had a great time and look forward to next year.
WA2KOK	Nice contest. Many signals from Europe.
KØTIV	My first RTTY contest. My greatest thrill was working my first DX.
SP2UUU	Just got my license in October and now all my family is QRV on RTTY. Enjoyed the contest.
VE7VP	Enjoyed the contest and picked up two new countries.
HZ1AB	All continents except Africa. Earned a few new states.
W3BE	Wonderful contest!
PA3DBS	Very nice event. It was my first. Made many nice QSOs, and the conditions were good.
K6WZ	Almost got WAC on 10 meters.
KT1N	Been on RTTY 3 months and only sorry I didn't get started 25 years sooner. Had a ball.
EA5CVR	Enjoyed it very much.
VE6ZX	Enjoyed the contest very much. Forty and eighty meters were tough.
ON7EP	Great test.
SM6ASD	Twenty and fifteen meters exceeded everything I have experienced so far in RTTY contesting. Fantastic activity! I definitely look forward to the years ahead.
WP4AVW/EA4	My very first contest.
CT1AV	Thanks for the test. I am ready for 1985!
GW3EHN	Had power failure. There's always next year—I hope.
GU6JST	Glad to activate Guernsey on RTTY.
WB3FIZ	Good DXing. Both the wife (KA3GIK) and I thoroughly enjoyed it!
K8EX	This is our second year. A good time was had by all.

As Dee Crumpton N6ELP, *RTTY Journal* editor, and her staff put it, "It was fun, a lot of work, a lot of headaches compiling the scores, but we would do it all over again, anytime."

Our special thanks to Dee and the staff! Without the *RTTY Journal* behind this RTTY classic, we are sure this third annual event would not have made it this far. It's getting bigger and better each and every year. See you all next February for the 4th Annual World RTTY Championship.

4TH ANNUAL 75-METER WORLD SSB CHAMPIONSHIP 0000Z to 2400Z January 13

SPONSORED BY:

73: Amateur Radio's Technical Journal.

MISCELLANEOUS RULES:

Work as many stations as possible on 75-meter phone during the specified times of allowable operation.The same station may be worked only once. Crossmode contacts will not count. Single-operator stations may operate a total of 16 hours. All multi-operator stations may operate the entire 24-hour period. Off periods must be noted in your log(s) and on your summary sheet. Off periods are *no less than 30 minutes each.*

OPERATOR CLASS:

(A) single-operator, single transmitter, phone only. (B) multi-operator, single transmitter, phone only.

EXCHANGE:

Stations within the contiguous 48 US states and Canada transmit an RS report and state, province, or territory. All other stations, including Alaska and Hawaii, transmit RS report and DX country.

POINTS:

5 QSO points for contacts with W/VE stations located within the contiguous 48 US states and Canada. All other contacts are 10 points each. List points for each contact on your log sheets.

MULTIPLIERS:

1 multiplier point is earned for each US state (48 maximum—a District of Columbia contact may be substituted for a state of Maryland multiplier), each Canadian province or territory (13 maximum), and DX country (excluding the contiguous US and Canada).

FINAL SCORE:

Total OSO points times total multiplier points equals claimed score.

CONTEST ENTRIES:

Each entry must include a contest log, a dupe sheet, a contest summary, and a multiplier checklist. We recommend contestants send for a copy of the contest forms. Enclose an SASE to the contest address listed below.

ENTRY DEADLINE:

All entries must be postmarked no later than February 13, 1985.

DISQUALIFICATIONS:

Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each operator class in each of the contiguous 48 US states, Canadian provinces and territories, and each DX country represented. A minimum of 100 OSOs must be worked to be eligible for contest awards.

CONTEST ADDRESS:

To obtain entry forms or to submit an entry, forward an SASE to: 75-Meter Contest, Jose A. Castillo N4BAA, 1832 Highland Drive, Amelia Island FL 32034.

73'S 6TH ANNUAL 160-METER WORLD SSB CHAMPIONSHIP 0000Z January 19 to 2400Z January 20

OBJECT:

To work as many stations as possible on 160-meter phone in a maximum of 32 hours allowable contest time. Multi-operator stations may operate the entire 48-hour contest period. Stations may be worked only once.

ENTRY CATEGORIES:

(A) single-operator, single transmitter,

1984 RESULTS
WORLD RTTY CHAMPIONSHIP

Single-Operator Category—All Bands

Peter Rodmell	—G3ZRS	—145,520
Bo Stjernberg	—SM6ASD	—141,120
Jorgen Dudahl	—OZ1CRL	—136,300
John Johnson	—W3BE	—132,480
Barry Gardner	—W3FV	—118,340
Perozzo Etienne	—ON7EP	—94,205
Buraro Detudamo	—C21BD	—90,475
K. L. Miller	—VE7YB	—87,400
Vance Fauver	—WB5HBR	—87,380
Carl Steavenson	—K6WZ	—84,240
Andy McLellan	—VE1ASJ	—79,395
Roy Gould	—K7IN	—77,015
Dave Earnest	—HZ1AB	—67,500
Mort Toussaint	—N7AKQ	—64,800
Dan Kernan	—WA2KOK	—60,160
Olli Savolainen	—OH2BON	—58,650
Roger Simpson	—NQ6C	—56,000
Talma de Barros	—PP7GV	—54,400
Mrs. E. Farida	—LX2EL	—53,865
Alle Lofgren	—SM7AIA	—53,235
Bill Snyder	—WØLHS	—44,745
Clark Constant	—W9CD	—41,600
Denis Mahoney	—VE6ZX	—40,590
Jesus Dominguez	—EA1AEB	—37,675
Pepe Ferrer	—EA5CVR	—33,280
John Lee	—K6YK	—31,850
John Possehl	—W3KV	—31,255
Walt Amos	—K8CV	—30,805
Jose Stragla	—LU8ESU	—30,550
Jack Reed	—WA7LNW	—30,195
Lars Kjellgren	—SM7LSU	—28,575
James Swan	—VK2BOS	—23,690
T. H. Holtby	—VE7VP	—22,560
Willy Rogg	—HB9HK	—22,035
Werner Ludwig	—DF5BX	—19,110
Victor Holyoake	—G4OJJ	—17,415
J. O. Thomas	—GW3EHN	—17,000
Chuck Prindle	—W6JOX	—16,740
Robert Miller	—KB9SU	—16,720
Jan Kus	—SP9BCH	—15,120
Bob Lewis	—N4GXP	—14,070
P. M. Hendricx	—PA3DBS	—13,850
Jules Freundlich	—W2JGR	—12,420
Edwin Cortes	—WP4AVW	—10,230
John Orton	—WA6BOB	—9,990
Charles LeGrande	—AH6CS	—9,440
Dennis Grinnell	—G4MKO	—9,000
Greg Hanson	—KA1ZX	—8,835
Armando Mateos	—EA1AAO	—8,400
Arpad Sarkezi	—YU7AM	—8,370
Kurt Wustner	—DE1KWD	—7,750
Wolfgang Ferrting	—DLØDO	—7,250
Askene Vestermarle	—OZ1GRF	—6,750
Jake Meyer	—HP1XUL	—5,800
Elliott Hamilton	—WA9JIQ	—5,720
Carlos Laroca	—PY2CAR	—5,460
Zdenek Kasek	—OK2BFS	—4,590
Roger Bjerke	—KCØUM	—3,600
Juan Montalvo	—EA2AOV	—3,465
Neal Morris	—KØTIV	—3,255
Wagner Vlado	—YU2CB	—1,625
Kryzys Ulatowaki	—SP2UUU	—1,155
Diet Platthaus	—DJ8QO	—1,000

Single-Operator Category—20 Meters

Dima Slyusarenko	—UT5RP	—84,240
Larry Bruggensmith	—KI4BQ	—39,015
Jurgen Bieber	—DL9MBZ	—15,250
Tomas Asenjo	—EA4SB	—14,720
David Smith	—W6NCR	—12,950
Dusil Miroslav	—OK1AWC	—12,000
K. Tetterlaar	—VE7ATH	—11,220
Paul Clifford	—WA2AXO	—10,880
Leslie Harper	—W8CFJ	—9,990
Joe Hungate	—K8OM	—7,685
Kenneth Cote	—VE6BEV	—7,155
Kari Syrjanen	—OH5YW	—7,140
Richard Kriss	—KD5VU	—3,630
Ari Rodrigues	—PT2BW	—3,225
B. Strandberg	—SM6IJF	—1,260
Gary Moles	—ZL2AKI	—1,100

Single-Operator Category—15 Meters

Piero Giacomelli	—IK5CKL	—29,150
Hiroaki Kubo	—JR6YAH	—28,380
Norman Buckley	—KC7RG	—10,880
Miguel Quijano	—WA2HLV	—5,610
Roger Thering	—KE6T	—4,995
Hirofumi Kondo	—JF2PZH	—4,725

Single-Operator Category—10 Meters

James Sladek	—WB4UBD	—1,890

Multi-Operator Category—All Bands

Mike Bottema	—K8EX	—166,950
Pasquale Ventresca	—WB3FIZ	—102,225
Radioklub PRI	—OD1PM	—70,725
Leicester Polytech	—G3SDC	—65,995
Greg Haines	—WB4PRU	—48,900
Radioklub Zvazarm	—OK3KGI	—42,380
Radioklub	—OK3KYR	—30,140
Guernsey ARC	—GU3HFN	—12,025
Radioklub Murgasa	—OK3KJF	—8,800
Central Radioklub	—OK3KFV	—5,500

Multi-Operator Category—20 Meters

Sodermans Regemente	—SL5AR	—61,920

Check Logs: N8ELP, WB6AQR, Y25DL, F6AUS

phone only. (B) multi-operator, single transmitter, phone only.

EXCHANGE:

Stations within the contiguous 48 US states and Canada transmit RS report and state or province/territory. All others transmit RS report and DX country.

POINTS:

5 QSO points for contact with W/VE stations contacted within the contiguous 48 US states and Canada. All other contacts earn 10 points each.

MULTIPLIERS:

1 multiplier point will be earned for each of the contiguous US states (48 maximum—a District of Columbia contact may be substituted for a state of Maryland multiplier), each of the Canadian provinces/territories (13 maximum), and each DX country outside the contiguous 48 US states and Canada.

FINAL SCORE:

Total QSO points times total multiplier points equals claimed score.

CONTEST ENTRIES:

Each entry must include log sheets, a dupe sheet for 100 or more contacts, a contest summary, and a multiplier check sheet.

ENTRY DEADLINE:

All entries must be postmarked no later than February 20, 1985.

DX WINDOW:

Stations are expected to observe the DX window from 1.825-1.830 MHz as mutually agreed by Top-Band operators. Stations in the US and Canada are asked not to transmit in this 5-kHz segment of the band. During the contest all W/VE stations are requested to utilize only those frequencies from 1.808-1.825 and 1.830-1.900 MHz.

DISQUALIFICATIONS:

Disqualification may result if contestants omit any required entry form, operate in excess of legal power authorized for the given area, manipulate operating times to achieve score advantage, or fail to omit duplicate contacts which would reduce the overall score more than 2%. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each entry category in each of the contiguous 48 US states, each Canadian province/territory, and each DX country. A minimum of 100 QSOs must be worked to qualify.

CONTEST ADDRESS:

To obtain information or entry forms, or to submit a contest entry, forward an SASE to: 160-Meter Contest, Harry Arsenault K1PLR, 603 Powell Avenue, Erie PA 16505.

1ST ANNUAL 15-METER WORLD SSB CHAMPIONSHIP
0000Z to 2400Z January 26

SPONSORED BY:

73: Amateur Radio's Technical Journal.

MISCELLANEOUS RULES:

Work as many stations as possible on 15-meter phone during the specified times of allowable operation. Stations may be worked once. Crossmode contacts will not count. Single-operator stations may operate a total of 16 hours. All multi-operator stations may operate the entire 24-hour period. Off periods must be noted in your logs and on your summary sheet. Off periods are *no less than 30 minutes each.*

OPERATOR CLASS:

(A) single-operator, single transmitter, phone only. (B) multi-operator, single transmitter, phone only.

EXCHANGE:

Stations within the contiguous 48 US states and Canada transmit an RS report and state, province, or territory. All other stations, including Alaska and Hawaii, transmit RS report and DX country.

POINTS:

5 QSO points for contact *within* your continent. 10 QSO points for contact *outside* your continent. List points for each contact on your log sheets.

MULTIPLIERS:

1 multiplier point is earned for each US state (48 maximum—a District of Columbia contact may be substituted for a state of Maryland multiplier), each Canadian province or territory (13 maximum), and DX country (excluding the contiguous US and Canada).

FINAL SCORE:

Total QSO points times total multiplier points equals claimed score.

CONTEST ENTRIES:

Each entry must include a contest log, a dupe sheet, a contest summary, and a multiplier checklist. We recommend contestants send for a copy of the contest forms. Enclose an SASE to the contest address listed below.

ENTRY DEADLINES:

All entries must be postmarked no later than February 28, 1985.

DISQUALIFICATIONS:

Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each operator class in each of the contiguous 48 US states, Canadian provinces and territories, and each DX country represented. A minimum of 100 QSOs must be worked to be eligible for contest awards.

CONTEST ADDRESS:

To obtain entry forms or to submit an entry, forward an SASE to: 15-Meter Contest Chairman, Bill Gosney KE7C, 2665 N. Busby Rd., Oak Harbor WA 98277.

1ST ANNUAL 20-METER WORLD SSB CHAMPIONSHIP
0000Z to 2400Z January 27

SPONSORED BY:

73: Amateur Radio's Technical Journal.

MISCELLANEOUS RULES:

Work as many stations as possible on

20-meter phone during the specified times of allowable operation. Stations may be worked once. Crossmode contacts will not count. Single-operator stations may operate a total of 16 hours. All the multi-operator stations may operate the entire 24-hour period. Off periods must be noted in your log(s) and on your summary sheet. Off periods are *no less than 30 minutes each.*

OPERATOR CLASSES:

(A) single-operator, single transmitter, phone only. (B) multi-operator, single transmitter, phone only.

EXCHANGE:

Stations within the 48 contiguous US states and Canada transmit an RS report and state, province, or territory. All other stations, including Alaska and Hawaii, transmit RS report and DX country.

POINTS:

5 QSO points for contact *within* your continent. 10 QSO points for contact *outside* your continent. List points for each contact on your log sheets.

MULTIPLIERS:

1 multiplier point is earned for each US state (48 maximum—a District of Columbia contact may be substituted for a Maryland multiplier), each Canadian province or territory (13 maximum), and DX country (excluding the contiguous US and Canada).

FINAL SCORES:

Total QSO points times total multiplier points equals claimed score.

CONTEST ENTRIES:

Each entry must include a contest log, a dupe sheet, a contest summary, and a multiplier checklist. We recommend that contestants send for a copy of the contest forms. Enclose an SASE to the contest address listed below.

CONTEST DEADLINE:

Each entry must be postmarked no later than February 27, 1985.

DISQUALIFICATIONS:

Omission of any required entry form, operating in excess of legal power, manipulating of contest scores or times to achieve a score advantage, or failure to omit duplicate contacts which would reduce the overall score more than 2% are all grounds for immediate disqualification. Decisions of the contest committee are final.

AWARDS:

Contest awards will be issued in each operator class in each of the contiguous 48 US states, Canadian provinces and territories, and each DX country represented. A minimum of 100 QSOs must be worked to be eligible for contest awards.

CONTEST ADDRESS:

To obtain entry forms, or to submit an entry, forward an SASE to: 20-Meter Contest Chairman, Chuck Ingram WA6R, 44720 N. 11th St. E, Lancaster CA 93535.

AWARDS

Bill Gosney KE7C
Micro-80, Inc.
2665 North Busby Road
Oak Harbor WA 98277

THE AWARDS PROGRAM OF *73: AMATEUR RADIO'S TECHNICAL JOURNAL*

It's hard to believe the years which have passed since our initial announcement of the now famous *73* Awards Program portfolio. Since its introduction by yours truly, KE7C, in 1979, we've seen the program grow to become one of the most popular challenges facing amateurs today!

Consisting of six domestic and five DX operating achievements, the program has captured the interest of many of our fellow amateurs, rag-chewers, DXers, and contesters alike.

How does *73* process award applications? Upon receipt of an application, each entry is carefully scrutinized for authenticity. They must be sent to the Awards Manager in the proper format (as noted in the award rules), otherwise they must be returned to the applicant.

If approved, a work sheet is prepared. A copy is sent to *73* headquarters to process your certificate. It is there that your award is given a personal touch and later mailed to your door. (A copy of the work sheet is also mailed to the applicant at the same time to acknowledge receipt of the application.)

Should an applicant feel it is necessary to follow up on an application, send your inquiry to: *73*, Award Certificate Processing Department, 80 Pine Street, Peterborough NH 03458, USA. Always enclose a stamped business-size envelope with your letter.

We hope you enjoy the challenges of the *73* Awards Program. We ask that you share it with your amateur friends.

While we hope you'll pursue these awards, we also ask that you send the Awards Manager any information you might have on other awards which have never appeared between the covers of this magazine. Our files are getting bare, and it is the input of our readers that keeps the image of this column original and creative! If your club sponsors an award, why not share it with our readers throughout the world?

Now here are the six domestic awards being sought after by award seekers throughout the world. These awards are not meant to be an overnight venture, nor were they designed to duplicate any in existence today. Each offers its own degree of difficulty and creates a sense of accomplishment in those who are happy recipients. Next month we'll feature our five DX awards.

THE Q-5 AWARD OF EXCELLENCE

If you frequent the American Novice bands, you will be pleased to learn of an award exclusively for this portion of the spectrum. This award is not meant to be an overnight accomplishment. Stations meeting the challenge of this award will be proud to display it in their shack. It depicts the excellence and superiority of their station's transmitted signal as it is heard throughout the various US call districts.

1. The Q-5 Award is available to licensed amateurs and SWL stations throughout the world!
2. To qualify, applicants must work all ten US call districts and receive no less than a Q-5 readability report. A valid RST might be 599, 579, 549, etc., while an RST of 459, 449, or 469 would not qualify.
3. To be valid, all contacts must be made operating CW on those frequencies assigned the American Novice Contacts must be made on or after January 1, 1979.
4. There are no band restrictions; applicants may request special band endorsement, however, at the time application is made
5. To apply, prepare a list of claimed contacts, logging each one in order by the US call district worked. Include the station callsign, date and time in GMT, the frequency, and most important, the RST as noted on the confirmation card.
6. *Do not* send *QSL cards!* Have your list verified by two amateurs or a notary public.
7. Award fee is $5.00 in US funds (no IRCs or foreign currency). Checks written on foreign banks must be payable in US funds.
8. Forward your application and award fee to: Bill Gosney KE7C, *73* Awards Manager, 2665 N. Busby Road, Oak Harbor WA 98277, USA.

AWARD RECIPIENTS
(as of 9-1-84)
Q-5 AWARD OF EXCELLENCE

115.	VQ9JW	133.	VE4AKN
116.	VE3-9094	134.	KA2RIT
117.	W3RZD	135.	WD4CNZ
118.	WA1TBV	136.	N8FBY
119.	KA0NPR	137.	KA9QYA
120.	KA2OMX	138.	KA9RLR
121.	KA5JYL	139.	KA0OMP
122.	KA4WYA	140.	KC4UB
123.	KA8SNN	141.	KA9ISV
124.	KA6SOC	142.	KA0QEA
125.	WD0AVG	143.	KA3FHV
126.	WD8BKE	144.	KA2RSH
127.	WD9GYX	145.	KA9OKV
128.	KB4BSO	146.	WH8AVA
129.	KA2GSD	147.	KA5RNH
130.	DA1WJ	148.	VE5ADO
131.	KB4GYC	149.	LU1CLA
132.	WB3LHY	150.	KA9HKB

CENTURY CITIES AWARD

Designed as a dual worked-all-states effort, the editors of *73* present the Century Cities Award. The applicant who has earned this recognition has accomplished probably the greatest feat available in WAS award programs.

1. This award is available to licensed amateur and SWL stations throughout the world.
2. All contacts must be made on or after January 1, 1979, to be valid.
3. To qualify, the applicant must work and confirm a minimum of two cities or towns in each of the fifty (50) US states, for a total of 100.
4. To apply, prepare a list of contacts in alphabetical order by state Include the callsign, the date and time of the contact in GMT, the band, and the city. Your list would look something like the following. First line, five columns: Alabama KA4ZZZ 4/30/84 7 MHz Decatur; second line, last four columns: W4MKU 11/15/82 21 MHz Huntsville; third line, five columns: Alaska KL7MI 5/18/83 14 MHz Anchorage, and so on.
5. *Do not send QSL cards!* Have your claimed contact list verified by two amateurs or a notary public.
6. Award fee is $5.00 in US funds. Do not send IRCs or foreign currency as they are no longer acceptable. Checks written on foreign banks must be payable in US funds.
7. Forward your application and award fee to: Bill Gosney KE7C, *73* Awards Manager, 2665 N. Busby Road, Oak Harbor WA 98277, USA.

AWARD RECIPIENTS
(as of 9-1-84)
CENTURY CITIES AWARD

39.	K9LJP
40.	KA9LYH
41.	HC2RG
42.	PY2OBU
43.	KX5U
44.	WA8BIJ
45.	KA6OGC
46.	W9JBR

AWARD RECIPIENTS
(as of 9-1-84)
TEN-METER 10-40 AWARD

1.	W6OLA/7
2.	K4JSI/6

SPECIALTY COMMUNICATIONS ACHIEVEMENT AWARD (CLASS A)

1. Available to licensed amateurs and SWL stations throughout the world, this award requires that all contacts be made on or after January 1, 1979.
2. Only communications via SSTV, RTTY, EME (Earth-moon-Earth), and/or OSCAR satellites will be recognized for this award. Contacts between stations on OSCAR and EME may be made using any authorized mode allowed in your country. Mixed-mode contacts are not valid.
3. To qualify, applicants must work and confirm contact with each of the 50 US states. There are no band requirements. Specific band accomplishments will be recognized, however, if requested at the time application is made.
4. To apply, the applicant must prepare a list of claimed contacts in alphabetical order by state. Include the date and time in GMT, the band and mode of operation, and a description of the equipment and antenna system used.
5. *Do not send QSL cards!* Have your list verified by two amateurs or a notary public.
6. Award fee is $5.00 in US funds only. Sorry, we cannot accept IRCs or foreign currency.
7. Forward your application and award fee to: Bill Gosney KE7C, *73* Awards Manager, 2665 N. Busby Road, Oak Harbor WA 98277, USA.

TEN-METER 10-40 AWARD

What would an awards program be without a stateside QRP incentive? Designed especially for owners of converted CB equipment, the 10-40 award is probably the roughest worked-all-states award in existence. If you don't believe it, ask those who've tried numerous times and failed!

AWARD RECIPIENTS
(as of 9-1-84)
ANNUAL WORKED ALL USA AWARD

Mixed Band
86. KA7MPJ
87. KA9JJK
88. VE7EIK
89. N4HPX
90. I0AOF(RTTY)
91. I0AOF(CW)
92. KI2G
93. PY1DWM
94. YB2BLI(RTTY)
95. VP2MO
96. KA6OGC
97. KA2PHQ
98. KX5U

6 Meters
6. K3HFV
7. N4QH
8. N5DDB
9. N9CEX
10. K4GOK
11. W4CKD

10 Meters
7. N4QH
8. N5CSW
9. KA9HVV
10. VE2FOH
11. HI3VAK

15 Meters
4. WB6CDM
5. KA4IFF
6. WB9UKS
7. N4QH
8. WB7VBQ
9. KA6SOC

20 Meters
10. KA9INF
11. KA9JOL
12. KE7C
13. KC4YY
14. WA0CEL
15. KA4OOU
16. KA9LYH
17. WA9AEA
18. JH8NYK

30 Meters
1. K3WGA

40 Meters
3. WD4DBJ
4. WD0BOS
5. N5AHZ
6. N4QH
7. KA1DNB
8. K4NRR

80 Meters
10. WB2ZEL
11. K9LJP
12. KI4Y
13. KQ7Y
14. K3KCY
15. WB9YUH

160 Meters
1. KC8P

AWARD RECIPIENTS
(as of 9-1-84)
DISTRICT ENDURANCE AWARD

8. XE1TIS (49 MIN)
9. K0WNY (52 MIN)
10. KE7C (14 MIN)
11. KA3FUU (50 MIN)
12. SV1GJ (42 MIN)
13. OK2QX (56 MIN)
14. KA9MMD (39 MIN)
15. I5MXX (18 MIN)
16. P29NSF (28 MIN)
17. VE5ADO (51 MIN)

1. This award is available to licensed amateurs and SWL stations throughout the world.

2. To be valid, all contacts must be made on the ten-meter band using only converted CB equipment or other low-power (20 Watts output or less) commercial gear. External amplifiers are prohibited. Contacts must be made on or after October 1, 1978, on AM, SSB, CW, or FM. Crossmode contacts will not count.

3. To qualify, applicants must work and confirm at least forty (40) US states.

4. To apply, list contacts made in alphabetical order by US state beginning with Alabama. Include the call of the station worked, the date and time in GMT, the mode of operation, and a brief description of the equipment and antenna system utilized to make the contacts.

5. *Do not send QSL cards*! Have your list verified by two amateurs or a notary public.

6. Award fee is $5.00 in US funds. IRCs or foreign currency are not acceptable. Checks written on foreign banks must be in US funds.

7. Forward your application and award fee to: Bill Gosney KE7C, *73* Awards Manager, 2665 N. Busby Road, Oak Harbor WA 98277, USA.

ANNUAL WORKED ALL USA AWARD

1. If you're looking for a stateside award with a challenge, this one is definitely the one. The annual Worked All USA Award is available to licensed amateurs and SWL stations throughout the world.

2. To qualify, applicants must work each of the fifty (50) US states within the same calendar year (January 1 through December 31). Annual endorsements will be awarded each subsequent year that an applicant qualifies again.

3. All valid contacts must be made on or after January 1, 1979. There is an award for single-band accomplishments on 2, 6, 10, 15, 20, 30, 40, 75, and 160 meters. A mixed-band award is also available.

4. To apply, prepare a list of claimed contacts in alphabetical order by state. List the state, the callsign of the station worked, the date and time in GMT, and the band and mode of operation.

5. *Do not send QSL cards*! Have your list of contacts verified by two amateurs or by a notary public.

6. The fee for this award is $5.00 in US funds. Annual endorsements are $2.50. We are sorry, but we can no longer accept IRCs or foreign currency. Checks written on foreign banks must be payable in US funds.

7. Forward you application and award fee to: Bill Gosney KE7C, *73* Awards Manager, 2665 N. Busby Road, Oak Harbor WA 98277, USA.

DISTRICT ENDURANCE AWARD

If any of our readers feel our awards are too easy, take a hard look at this award! Looks simple, huh? Don't be deceived. Try pursuing it; it will drive you right up the wall with frustration. Known as the District Endurance Award, you'll need to find yourself an accurate timepiece, as you'll have exactly sixty (60) minutes to work all ten (10) US call districts. If you surpass the time limit, you'll have to start all over again. It definitely takes some planning, perhaps even some band changing.

Oh, one last important point. All contacts must be made independent of nets, any net-type operations, and not while a contest is underway! Any takers?

1. The District Endurance Award is available to licensed amateurs and SWL stations worldwide.

2. To be valid, all contacts must be made on or after January 1, 1979. There will be no band or mode restrictions. If you are fortunate to work all contacts on a single band, however, we will be happy to recognize that feat should you mention it at the time application is made.

3. To qualify, applicants must work all ten (10) US call districts in one hour or less. The time will commence the moment the first contact is established (callsign and RST are exchanged) and end the moment the 10th call-district contact is made. Call districts can be worked in any order so long as all ten districts are worked within the 60-minute period.

4. To apply, applicants must state in their applications that all contacts were made independent of net or contest operation. Applicants must prepare a list of claimed contacts in callsign order by district. Include the date and time in GMT, the band and mode of operation, and the state.

5. *Do not send QSL cards*! Have your claimed list of contacts verified by two amateurs or a notary public.

6. Award fee is $5.00 and must be payable in US funds (no IRCs or foreign currency). Checks written on foreign banks must be payable in US funds.

7. Forward your application and award fee to: Bill Gosney KE7C, *73* Awards Manager, 2665 N. Busby Road, Oak Harbor WA 98277, USA.

from page 60

Activity—Band Usage

On the HF bands, 40, 20, 15, and 10 meters, an average of 40% were active; 160m attracted 7%, and the new 30m band just under 5%. (This band has been available for only about 12-18 months.) At VHF and above, 4.4% operated on 6m, just over half (51%) are active on 2m, 6.4% on 70cm, and an average of 0.3% on all other bands above 70cm. Good intentions were always indicated by an average of 15% for future HF activity (presumably by way of upgrading), 11% moving up to 70cm, and 2% indicated future use of frequencies above 432 MHz.

Time Spent on Hobby

"Gilding the lily" should have been included in this section because the time the average radio operator spent at the hobby was 48.4 hours per week! No wonder some XYLs and possibly a few OMs growl now and then. The average figures given are in Fig. 3.

A rewording of the question in this section is necessary, as it is known that all individual amateurs do not participate in all these activities in any one given week, but it still is an interesting result when viewed with circumspection.

How Introduced to Amateur Radio

Personal contact with friends or relatives accounted for over 63% of the introductions to amateur radio. Just under 21% came via shortwave listening, and only 7% resulted from Branch/club activity, which was on a par with those who first read about the hobby.

How Long Before Ambition to Become an Amateur was Realized

In the age group up to 40 years it took, on average, just over a year to get a license after being infected by personal contact with another amateur at school, at work, or within the family. At the other end of the age scale, first exposure to amateur radio came through the armed forces or personal contact, and it took another seven years to get a license.

Conclusions

There is a lot to be learned from the survey, not the least being the way the questions are phrased. Figures are also required about satellite operations, packet radio, use of computers in amateur radio, and so on. Several surveys will be necessary before trends can be seen properly, but at least the completion of this, the first one, is a start to help with the planning for the future of amateur radio here in ZL.

VHF ACTIVITY FROM NIUE ISLAND

Six-meter beacon—ZK2SIX—52.100 MHz—antenna at present, an 800' long rhombic at 80' high, but it is only temporary. . . another antenna is to be built that will be a bit more omnidirectional and can be attached permanently to the beacon. The beacon was put up by Bob Sutton ZK2RS, and he reports the life of the beacon is uncertain after his departure from the island in November or December this year when he returns to ZL.

Warrick ZL8AFH, Raoul Island, finished his tour of duty there and left the island late in August. His replacement is not an amateur licensee, so once again Raoul Island goes QRT for an indefinite period.

DX QSL TIP

Ron K6OZL, who recently operated from Northern Cooks as ZK1XL, reports: When sending QSL cards to areas where it is hot and humid, put a piece of waxed paper under the flap of the self-addressed envelope you send. Out of 2500 cards he received, 2495 were stuck shut by the humidity! The other five had waxed paper under the flap.

OLD TIMERS CLUB

This is the ZL equivalent of the Quarter Century Wireless Association. Certificates were awarded to Jack Ashford ZL2RO, Graham Goodger ZL2RP, Lou Smith ZL4BF, and Bill Turner ZL1PY recently for their long association with amateur radio.

Silent keys recorded this month were Len Chisholm ZL3UK, Pat Senior ZL3VQ, and Roger Bacon ZL1SG, all long-serving amateurs and members of the OTC.

As this column, by my calculations, will appear in the December issue of *73*, I wish to thank all those who have written to me regarding the ZL scene and extend to all *73* readers and staff the best of festive greetings from all here down under in ZL-land and a very Happy Christmas. I hope Father Christmas brings you all something good for the shack on Christmas morning; I'll be thinking of you all on that special day.

Ages	Percent
10-19	1.22
20-29	6.51
30-39	16.32
40-49	20.28
50-59	22.77
60-69	21.4
Over 69	11.5

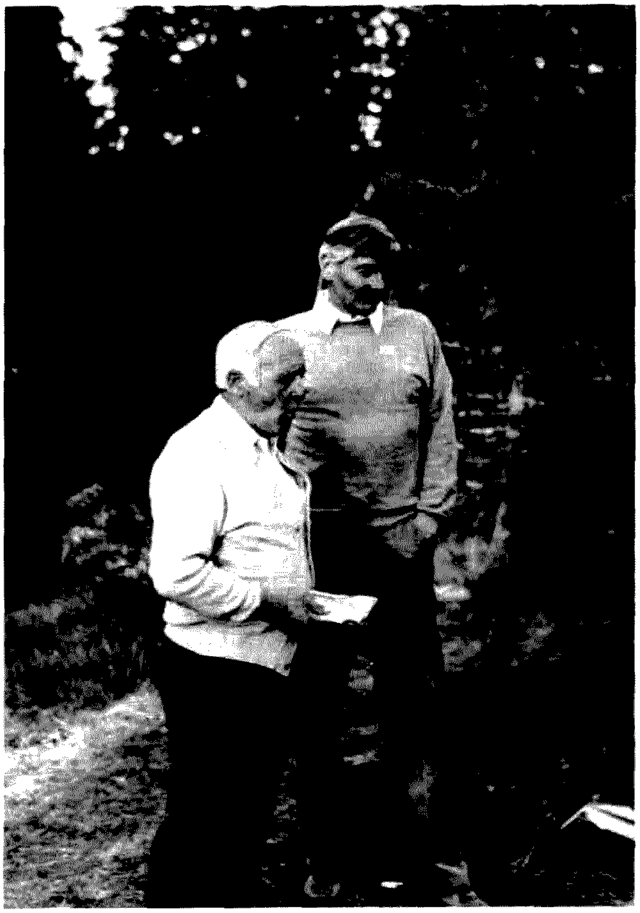
Fig. 1.

$ Value	%Home-Brew	%Commercial
100	9.	1.20
1000	67.	24.
1500	13.	16.
3000	9.	35.
4500	1.25	16.
6000	0.25	4.25
7500	0.16	1.75
9000		0.30
10,000		0.15
More		1.40

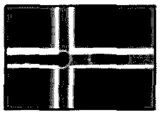
Fig. 2.

Activity	Time (Hours per week)
Equipment	
Operating	7.7
Design	6.3
Construction	7.3
Reading	
Magazines	8.0
Books	7.0
Club Activity	5.6
Other Activity	6.5

Fig. 3.



Wilfred LA6SL and Knut LA9YF, the editor of Amatør Radio *and a member of the HQ staff of NRRL.*



NORWAY

Bjorn-Hugo Ark LA5YJ
N-3120 Andebu
Norway

Well, hi there, fellows, hope you enjoyed my last column, because here I am again, this time with a newcomer in the Norwegian amateur-radio meetings. The Skumsjoe Treff-84, the first of what I sincerely hope will be an annual meeting, because this was something new.

Only a week after our hasty return from HAM-84 in southern Germany, described in November's *73*, we had the opportunity and great pleasure to attend another ham meeting, held in the central part of Norway. Up in the mountains, it was close to an idyllic lake, the Skumsjoe Lake, surrounded by some low hills between the two cities of Raufoss and Gjoevik. Because of lack of time and some unfortunate bad weather which hit the whole area *except* this specific spot, not too many did attend, but with the results being as they were, I'm sure the number next year will be quite another story.

I must say that such a cozy meeting will never be forgotten. The program was arranged so as to get as many as possible of the hams to bring their families with them and just enjoy themselves. The ham-radio shop, Norsk Radio Supply, showed up on very short notice with an exhibition of the latest from Yaesu Musen, Telex Hy-Gain, Cushcraft, etc., and the more than 50 amateurs there had a super time seeing and touching the newest technology in ham radio. Normally, they have to travel from 2-4 hours to get to Oslo, where the shop is situated. The arrangement was made by the local section of NRRL, the Gjovik group, and one of the main goals was to get as many as possible of the local CB clubs to attend and introduce them to ham radio; I understand this was a total success and guess that we are going to get quite a few new hams from that area in the future.

Saturday night had the big feature, with a barbeque with a whole pig being roasted, dancing to music produced live by Wilfred LA6SL, amateurs chatting, wives and kids doing more or less the same, except for the few Vikings taking a bath in 14-degree-Celsius water—the author absolutely *not* included! But mind you, the pig was delicious. Knut LA9YF (maybe our new president) was attending on behalf of the HQ of NRRL and gave an informative speech to the CBers.

On Sunday there was a fox-hunting competition, with quite a few newcomers; to be honest, most of us were, including myself, and I did hear the foxes but I never saw one.

DX

My last column didn't give you any information on DX since I haven't been active at all for over a month. This is just due to too much work and traveling. Another thing is that I have moved my QTH and I can assure you that my new QTH absolutely is not the DXers dream. Later I will

give you a description of my old setup and, of course, the new one. I must say that I'm more curious than desperate about how I will manage to work any new ones at all, because those mountains will surely be a challenge to work DX over. In the meantime, you must be satisfied with reading my presentations on other DXers, who have the opportunity to work them all.

Bjorn Waller SM6EHY

One of the well-known low-band DXers in Scandinavia is Bjorn Waller SM6EHY of Hindas, Sweden. He has been one of those you always hear working the rare ones, either on 80 or 160 meters; the latter seems to be of most interest to him recently.

I had the opportunity to run into Bjorn at HAM-84 at Friedrichshafen, and it was an unforgettable moment. You may ask, why? Well, it's very seldom you are able to meet someone with such identical interests as yourself. Antennas, propagation, and low-band DXing. It's one of the rare times you always will remember. And a new friendship has been made. We had, of course, met on the air, but I think we were chatting for two hours each of the two days I was there.

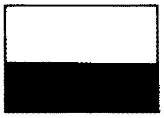
Bjorn is a nice looking fellow, born in 1956 and first licensed in 1971. He's unmarried and lives with his parents in a nice villa, 35 km east of Goteborg in southern Sweden, facing a large lake. He got interested in DXing when someone told him about the possibility of working it on 80 meters, in the winter of 1976, and since then he's been really bitten by the bug. His recent DXCC status is 138 mixed and 132 CW, all on 80 meters. But he told me that he has 240 worked, all CW, all on 80 meters, and, believe it or not, 103 worked on CW on 160 meters. Remember, it was only last year that the Swedes got permission to work on 160 meters. His antenna on 160 is a 1/4-wave sloper up 30 meters above a large ground system with some 200-meter-long radials.

On 80 meters he runs a 4-element phased vertical beam with 400 radials, and having as much space as he has, he is running quite a few Beverage antennas stretched 3 meters above the ground. As he says, a total of some 23 km of wire. Wonder what the neighbors say? Or what about living in a bird cage? Hi! Anyway, he's a marvelous DXer on low bands, and watch out guys, he is really going to hit hard on the higher bands, as well. Up till now he has been running a dipole on 10 and 15 meters and a ground plane on 20 meters, but look at what he has going now: a 39-meter tower, rotatable, with stacked yagis, 6 over 6, on 20, 15, and 10 meters; on 40 meters, a 3-element yagi, but it's possible he will try a 2 over 2 instead. I sincerely wish him luck.

Bjorn SM6EHY is also very well known as an active 2-meter ham, working EME, tropo, sporadic E, and aurora; he is really keeping the air glowing with rf. His rig is, of course, a TR-7 and 4B-line all made by R. L. Drake Company, and he runs a homebrew linear amplifier giving the legal power. And if this is not enough, he is even a high-speed CW operator as well. So I really wonder, this does not sound very amateur-like. It's quite professional radioing.

Bjorn is always happy to QSO with DX; if you hear him, get yourself a schedule for an EME or low-band QSO. Where the DX is, he is. SM6EHY will surely be one of those big, big signals out of Europe, and I bet he will be hard to beat in a contest. Maybe the Finns (OHs) have some serious competition to come?

Bjorn SM6EHY at HAM-84, Friedrichshafen.



POLAND

Jerzy Szymczak
78-200 Bialogard
Buczka 2/3
Poland

ELECTORAL CAMPAIGN

At the end of 1984, deputies to the National Congress of PRAA will gather. They were elected by district conventions, including the district convention in Katowice on March 25th, where many members and invited guests heard a lecture by the outgoing board about organization troubles related to nearly two years of licensing difficulties.

It is to be regretted that so many former hams do not put in for licenses again. The first Polish UHF-FM repeater, resumption of transmitting of district bulletins, and rapid development of the radiotelephone networks were numbered among positive aspects of district activity. The chief of the repeater group and the initiator of the Polish QRP Club gave the final lecture.

A 10-person District Board, 6-person Auditing Committee, and 22 delegates to the National Congress were elected during the convention. New President SP9MM, new Vice-President SP9EU, and continuing Secretary SP9DL entered on their duties.

Before and during the convention an equipment exchange enabled many radio amateurs to purchase components and, for the first time, circuit boards for the locally-designed transceiver, "Bartek." On April 1st the district conventions of PRAA in Poznan and Bielsko Biala took place.

Discussed at the convention in Katowice was the first Polish UHF-FM repeater in Podzamcze, near Zawiercie, built by radio amateurs of the Clubs: SP9PDG in Dabrowa Gornicza, SP9PEZ in Katowice, SP9PPP in Bytom, and SP9PKD in Zawiercie. Chief constructors of the repeater were: Jerzy Wojciechowski SP9MCW, Jacek Ziemniak SP9CSW, and Zbigniew Sitko SP9-2841.

The automatically-controlled repeater, SR9E, works on channel R0 (input 145,000 kHz, output 145,600 kHz) with the power of the transmitter set at 1 W. Installation consists of three basic subassemblies: a receiver, a transmitter, and a control system. The control system includes the generator of the callsign SR9E and a system for repeater access controllable by the modulation tone of 1750 Hz. The device mates with two independent groundplane antennas. A third antenna is being prepared for a radio beacon that would begin its work after a granting of permission. The radio beacon SP9VHE, emitting F2 with power of 100 mW, will be installed 504 meters above sea level to guarantee long range under good conditions. There are two independent diplexers between the antennas and the converter. In the future, the architects of the contraption will install more diplexers and use a common antenna for sending and receiving.

PORTUGAL

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2765 Portugal

As mentioned before, the new rules for the ham service came into force in July, 1983. However, thanks to the helpfulness of the Secretary of Communications, a commission was formed by five hams who will collaborate in review of the rules. The nominated hams are CT1VV, CT1BH, CT1WW, CT1AL, and CT1GM. We think that in the very near future we can really announce that we have rules according to the IARU Region 1 status.

I've received some letters from hams complaining of the delay in receiving QSLs via the Bureau. Despite other things written in several publications, The Portuguese QSL Bureau is in charge of R. E. P., Rede dos Emissores Portugueses (CT1REP). So send cards this way; the Bureau staff will take care of them with great care. They do handle cards almost daily.

VISITORS IN LISBON

This year, I have been very lucky meeting hams from several parts of the globe. Last July, Larry Lemas N6CCL and Wil LU8TEA (ex-CR6IK, CT4IK) came over to Portugal for their summer holidays and we had a short talk. Wil is my ex-neighbor in Africa, more precisely in Angola. Our thanks, and keep coming to this sunny European garden.

HAMS OVER THE CLOUDS

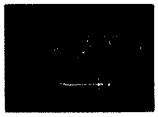
Celebrating the 32nd anniversary of the F.A.P.—Forca Aeria Portuguesa (the Portuguese Air Force) and taking an opportunity to promote this lovely hobby, two aeronautical mobile stations were active from two different airplanes. CT1CUG (Colonel Afonso), CT1GI (Lieutenant Colonel Brogueira), and CT4OA (Captain Leonel) were involved in this act. This operation had the support of the High Command, and the event was very well accepted by the hams and local authorities who issued the aeronautical mobile license. They send a nice award and QSL card for those who contacted them. The callsign used by them was CT7FAP/AM.

The planes were a Hercules C-130 and an Aviocar, and they handled the operation on their regular flights. On VHF, an ICOM 255E was used, and on HF they had a Kenwood TS-120S. These two operations were on the air for about a week, and nearly 13 flight hours were totaled. As a result, 750 contacts were made, with almost all European countries, Africa, and North and South America. For those who made contact and wish to receive a QSL card or award, you should send a QSL to: Comando Operacional da Forca Aeria, Monsanto, 1500 Lisboa, Portugal.

Last summer, I decided to go to Algarve (southern Portugal) and get some tropical weather down there. As a result, I had a nice chat with Edy G5BBD (known as the BBD of London, Hi), and I stayed 5 days with him.

Does anyone know the new address for W8CNL? If you do, drop me a line.

Finally, I do wish you a very happy and prosperous 1985, and let's look for the DXpeditions in the New Year coming.



SAUDI ARABIA

Don Muhl WA0DEI (HZ1AB)
PO Box 2445
Dhahran
Saudi Arabia

For some time now, several of us have been watching the "73 International" column in *73* for a report on Saudi Arabia. In the past several months the column has expanded to include many new countries, so several of us got together and prepared this for you. We have been quite candid and no names are listed, even those of our Saudi amateur friends, so that no one gets in trouble.

YES, AMATEUR RADIO IS ALIVE IN SAUDI ARABIA

Many amateurs worldwide have the misinformed idea, primarily from contact with the ARRL, that amateur radio doesn't exist in Saudi Arabia. This is quite far from the truth, but the curtailment of amateur radio in the Kingdom is supported by the strict rules imposed on those who do receive the right to operate. At present there are only 19 legally-licensed Saudi operators, one club station, and four non-Saudis. The last amateur-radio license was granted by the King in 1974. "Licensed" is possibly the wrong word; "decreed" would be better. There is no formal written amateur-radio license, only a letter signed by the King or one of the Royal Family Princes that allows the user to acquire equipment and then operate. Those granted such a decree then choose their own callsign in the HZ1 grouping if Saudi or in the 7Z1 grouping if non-Saudi.

Even though the Ministry of Post, Telephone, and Telecommunications (MOPTT, or PTT for short) is responsible for all radio communications, amateur operation is outside of their purview. PTT and the military only monitor the amateur operations for illegal or unauthorized usage. An example of unauthorized usage would

be to talk with any amateurs in any communist country or, especially, Israel. Even a quick exchange of signal reports is not allowed. The Saudi monitoring system is so effective that it takes less than a one-minute transmission with a 1-Watt handheld radio for the PTT to pinpoint the user to within 100 meters and send the police if it is a non-authorized user.

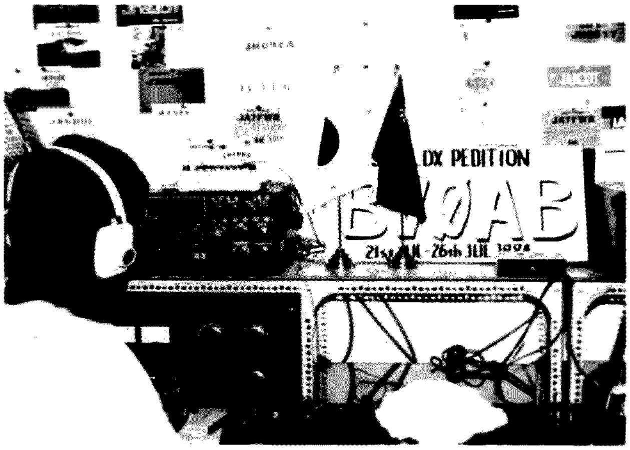
Amateur operation is limited to the five main HF bands and 2 meters; however, the 2-meter operation is limited to two channels in the 167–170-MHz range. This is specifically done so that no conversations can take place across the borders of the Kingdom with neighboring countries.

In addition to the twenty-four "licensed" operators in the Kingdom, there are also some 250 or more amateurs from other countries living and working in Saudi Arabia. Those that live and work in the Dhahran area are most fortunate, as they may visit and operate the Aramco Club Station at Dhahran Airport. This club station still operates under a Royal Decree issued by the King to Aramco prior to 1974. Any amateur-radio operator who is working in Saudi Arabia or is able through work to obtain a business visa can make arrangements through the US Army Communications Command Officer in Charge at Dhahran and may operate the club station, HZ1AB. This station, although totally under US military control, must still abide by all rules pertaining to individual amateur operators. Any slip by visitors or members operating HZ1AB could cause its shut-down immediately.

Several foreign amateurs living in Riyadh, the capital of Saudi Arabia some 400 km inland from Dhahran, attempted to establish a second club station during the summer and fall of 1983. Their efforts were totally negated thanks to two American women, a Korean, and two German businessmen who were caught within the same three-month period trying to smuggle amateur equipment into the Kingdom. This is just the tip of the iceberg when it comes to imposing restrictions on anyone, not just amateurs using HF radio. A further example is that any HF receiver capable of copying sideband is also considered a contraband item and will be confiscated by customs officials. This applies to equipment used by foreign governments as well as businesses or private citizens.

But all is not lost; many foreign amateurs do operate and quite often from the stations of those individuals who are licensed. All it takes is the nerve to get an audience with one of the licensed Princes (by the way, all licenses are to members of the Royal Family or their employees), and the Prince OKs use of his HZ callsign and operation at his station. When the four foreign employees leave, it is doubtful if any new 7Z1 callsigns will be issued until the problems in the Middle East are solved. Once one has lived in Saudi Arabia, it is easy to understand why the Saudis are very skeptical and have imposed such harsh controls over amateur-radio operations and HF radio operations in general that are not associated with their government or military.

One of the ham stations equipped by and made available by the Saudi Arabian government.



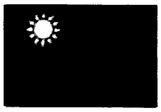
The DXpedition station, BV0AB, in Taipei, July, 1984.

One of the nice things about amateur radio in Saudi Arabia is the background of the other amateur operators one meets. For instance, the only licensed female amateur in Pakistan is with her husband working for one of the major banks; two Americans in Riyadh each hold callsigns for over 21 different countries, and there are five husband-and-wife teams. Instead of radio contacts, the hams use the several computer mailbox systems that are in existence country wide.

This pretty well covers amateur operations in Saudi Arabia. For anyone coming here to work, remember there are no tourists, and for those workers who are amateurs, remember: (1) Don't bring any equipment of any kind, including a receiver capable of sideband operation, (2) don't expect to operate just because you have a license from another country, (3) don't advertise—you can end up in jail or be deported immediately, and (4) under no condition can women be permitted to operate except at the Dhahran Club Station.

If anyone is planning employment in the Kingdom and is going to the Eastern Province (Dhahran/Al-Khobar/Damman/etc.), contact the Officer in Charge, US Army Communication Center, APO New York 09616, Attn: MARS Station, and it may save later embarrassment. For those going to the capital, Riyadh, or to any other location such as Khamis, Taif, Tabuk, or Jeddah, contact AFLC/LSG-LCC, USAF MARS Station AJ3RY, APO New York 09038 for assistance. Just remember, *don't* bring any equipment into the country. If one does receive the approval to operate, the equipment used will be that of one of the Princes at his station.

STATEMENT OF OWNERSHIP, MANAGEMENT AND CIRCULATION [illegible] John C. Burnett, Publisher



TAIWAN

Tim Chen BV2A/BV2B
PO Box 30-547
Taipei, Taiwan
Republic of China

One after another, DXpedition teams to BV-land from abroad have been coming. We're up to four now; possibly there will be two more to come in this year. Close cooperation between hams and local parties concerned show that we will have a good situation in amateur-radio activities.

The second Japanese group from JA6 was composed of the captain, JA6MS, and JA6VVS, JA6ERV, JA6GIP, JH6SOR, JE6MQW, JA5UIM/6, JF1JSP, and JH1IUN. They arrived in Taipei on July 21 and left on July 26. The trip was arranged in a hurry and their giant antennas were not received in time, so BV2A lent a 2-element tribander yagi and a 40/15-meter dipole.

Unfortunately, the weather in July was so terribly hot that the air conditioner in the operating room was of little help. Worse, radio propagation did not favor them. The callsign BV0AB was used on 7, 14, 21, and 28 MHz. Approximately 8,000 QSOs on CW and SSB were made, according to the group's statistics.

The above-mentioned late-arriving antennas consisting of a TA-351 5-element tribander yagi and a TD-3040 dipole finally arrived and were given to the CRA (China Radio Association) as a gift from the JARL. We are very appreciative of their generosity. We are also pleased to see the 2-inch callbooks of JA hams which were brought over by JA6MS and JA6VVS to a banquet given by the CRA. Mr. Chen, Division Chief of Ministry of Interiors, was asked to award a medal to both JA6MS and JA6VVS on behalf of the CRA to commemorate the special occasion and express appreciation.

Besides QSOs on the air, the Japanese were greeted by many visitors from abroad; among them were G4KLP, W9ZNY, OE3ALW, F6EXV, and JA1YDJ. Together with BV2A/BV2B, they and the representatives of the other countries talked for hours on the roof of the DXpedition station, BV0AB. Ken JA1YDJ was the captain of BV0JA and BV0YL, and he came back from Tokyo with an FT-757GX transceiver to be offered to CRA to add strength to stations in BV-land. He also brought us some copies of two popular magazines, *CQ* and *Mobil* (August issues), in which there were reports on the activities of BV0JA and BV0YL.

Although each expeditiion group did announce its QSL manager, there are still many QSL cards coming to us that we have to relay, causing considerable delay. In order to save time, here are the QSL managers: I2MQP/BV, I2NYN/BV, and I2BVS/BV via I2MQP; BV0AA via OH2BH, BV0JA and BV0YL via JG1QGT, and BV0AB via JH6SOR.

The coming expeditions (BV0W and BV0BG) will announce their QSL managers later.

As to the applications from interested DXpeditions, please be advised: apply for approval at least seven weeks ahead. It is necessary to include a detailed list of operators, licensed callsigns, the profession of each, and passport number (if available); also a list of equipment to be brought into this country stating manufacturer, model, serial number, power, frequency coverage, and numbers of transceivers or transmitters and receivers. Any omissions of the above will cause a delay in approval and call for unnecessary correspondence.

Furthermore, it is not recommended that you book your air passage before hearing from us. Owing to present facilities and limited manpower, we can allow only one expedition group in every two months. Therefore, overlapping applications will be denied or postponed. Last-minute applications can hardly be accepted.

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PROPAGATION

Jim Gray W1XU
73 Staff

EASTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15						20	20A	15			
ARGENTINA	20										15	15
AUSTRALIA	20					40	40			20	20	15
CANAL ZONE	40	40					20	15	15	15	15	20
ENGLAND	40	40	40	80	80		20	15	15	15	20	
HAWAII	20					40	20	20			15	15
INDIA							20	20				
JAPAN	15						20	20				15
MEXICO	40	40	40	40	40	40	20	15	15	15	15	20
PHILIPPINES							20	20				
PUERTO RICO	40	40	40	40	40	40	20	15	15	15	15	20
SOUTH AFRICA	40A	40						15	15	20		
U. S. S. R.		40						15	15	20		
WEST COAST	15	20	40	40	40	40	40A	20A	15	15	15	15

CENTRAL UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	20				40	40	20	20				20
ARGENTINA	20	40	40	40						15	15	20A
AUSTRALIA	15					40	20	20	20		15	15
CANAL ZONE	20		40	40	40			20	15	15	15	15
ENGLAND	40	40	80	80				15	15	15	20	
HAWAII	20	20			40	40	20	20	20	15	15A	15A
INDIA								20				
JAPAN	20				40	40	20	20				20
MEXICO	20		40	40	40			20	15	15	15	15
PHILIPPINES	20							20	20			
PUERTO RICO	20		40	40	40			20	15	15	15	15
SOUTH AFRICA	20	40	40						15	15	15	20
U. S. S. R.		40	40					15	15	20		

WESTERN UNITED STATES TO:

GMT:	00	02	04	06	08	10	12	14	16	18	20	22
ALASKA	15	15	20			40	40	40				20
ARGENTINA	20	20		40	40						15	15
AUSTRALIA	15	15	20				40		20	20	20	15
CANAL ZONE	20	20		40	40	40	40	40	15	15	15	15
ENGLAND			40	40					20A	20A		
HAWAII	15	20	20			40	40	40				15
INDIA		20	20									
JAPAN	15	15	20				40	40	40			20
MEXICO	20	20		40	40	40	40	40				15
PHILIPPINES	20A	20								20		
PUERTO RICO	20	20		40	40	40	40	40				15
SOUTH AFRICA	20	20							15	15	15	20
U. S. S. R.								20	20	20	20	
EAST COAST	15	20	40	40	40	40	20	20A	15	15	15	15

A = Next higher frequency may also be useful.
B = Difficult circuit this period.

G = Good, F = Fair, P = Poor.

DECEMBER

SUN	MON	TUE	WED	THU	FRI	SAT
						1 G
2 G	3 G	4 F	5 P	6 F	7 G	8 G
9 F	10 G	11 G	12 G	13 F	14 F-P	15 P
16 F	17 G	18 G-F	19 F-P	20 P	21 P	22 F
23 G / 30 F	24 G / 31 F-G	25 F	26 G	27 G	28 G	29 G-F